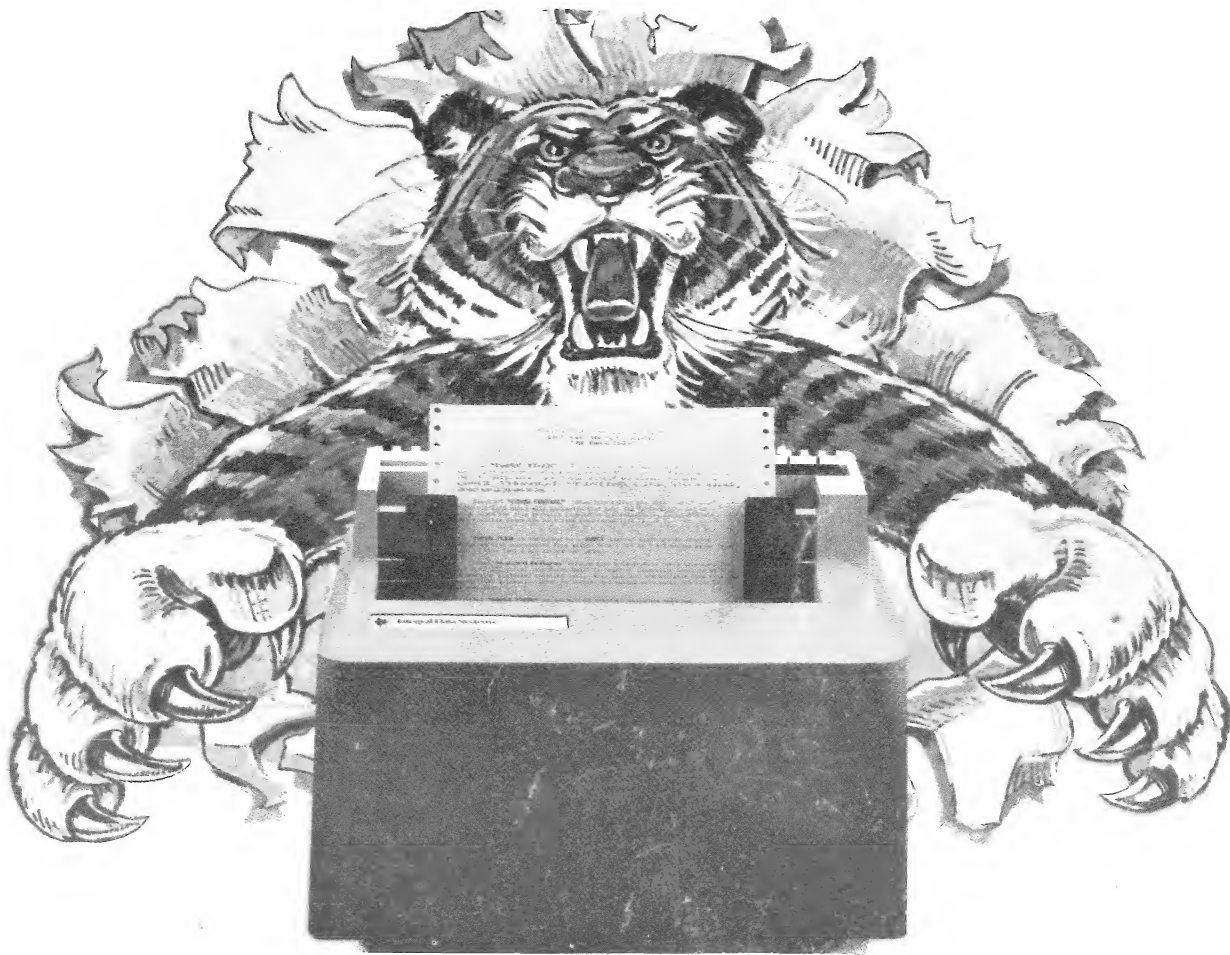


**THE PAPER TIGER™**  
**IDS-460**  
**IMPACT PRINTER**



**OWNER'S MANUAL**



**Integral Data Systems, Inc.**

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QUICK INDEX

For Information On:

Printer Performance Features  
Printer Technical Data

Go To Page:

1-2  
1-3

Unpacking  
Installation Procedures  
Selection of Parallel or Serial Interface Configuration  
Interface Cabling  
115/230 VAC Power Selection

2-1  
2-3  
2-3  
2-3  
2-8

Operator Controls and Indicators  
Manual (Switch Selectable) Operating Procedures  
DIP Switch Settings  
Software Controlled Operating Procedures  
Standard ASCII Character Set and Control Codes  
Printer Control Functions  
Programming Control Functions  
Paper and Ribbon Handling Procedures

3-1  
3-3  
3-4  
3-5  
3-5  
3-6  
3-9  
3-13

Optional Graphics Operation

4-1

Printer Cleaning and Lubricating  
Mechanical Adjustment Procedures  
Fuse Replacement  
Troubleshooting  
Controller and Power Supply Circuit Board Schematic

5-1  
5-3  
5-3  
5-4  
5-7

Centronics Compatible Interface Cable

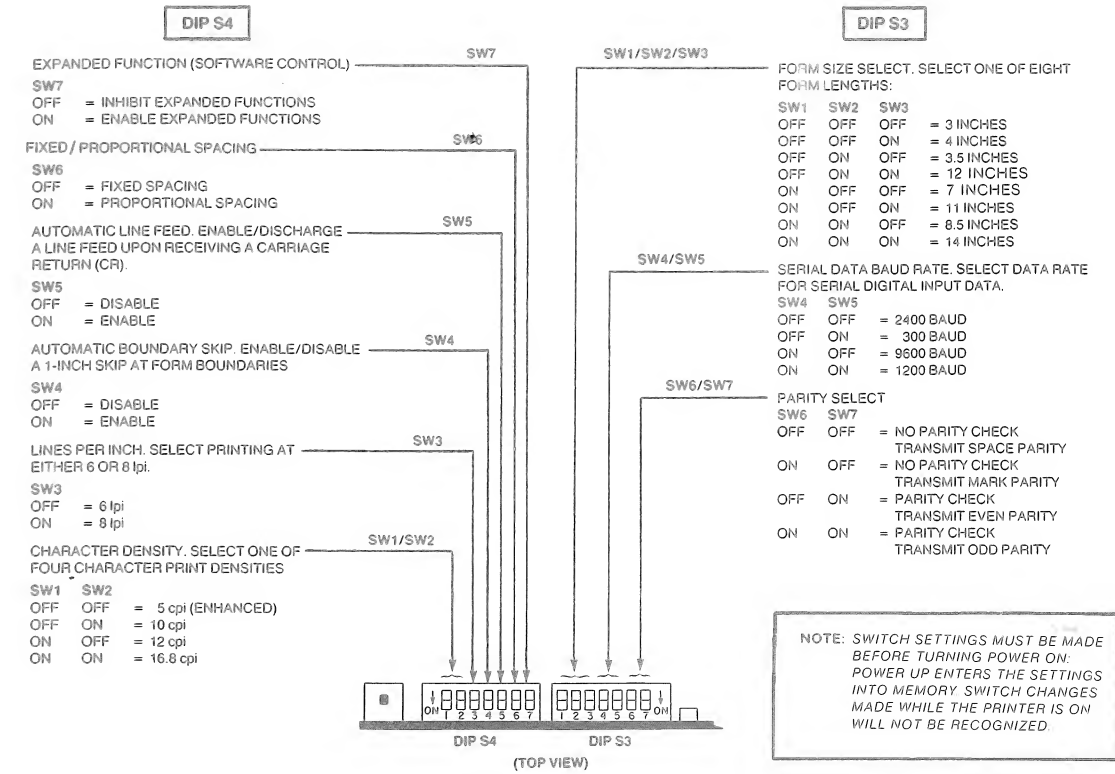
Appendix A

Print Samples

Appendix B

Control Code Reference Table

Inside Back Cover



Mode Select DIP Switches

Programmed Function	Command Character	No. Argument Fields	Argument Units	Default Values
Set Vertical ADV-1	B	1	1/48 inch	If DIP switch set to 6 lpi, default =8 units (8/48 inch). If DIP switch set to 8 lpi, default =6 units (6/48 inch).
Set Vertical ADV-2	C	1	1/48 inch	4 units (4/48 inch).
Set Vertical ADV-3	D	1	1/48 inch	-4 units (reverse 4/48 inch).
Set Vertical Tabs	E	1-8	1/48 inch	0 units
Set Horizontal Tabs	F	1-8	1/120 inch	0 units
Set Absolute Horizontal Position	G	1	1/120 inch	Set Head position relative to left margin.
Set Absolute Vertical Position	H	1	1/48 inch	Set Vertical position relative to top of form.
Set Right/Left Margins	J	2	1/120 inch	—
Set Form Size	L	2	1/48 inch	Per DIP switch setting.
Set Absolute Line	M	1	—	—
Set Horizontal Character Position	N	1	—	—
Set Intercharacter Spacing Increment	P	1	1/24 char. width	0 units

Programming Functioning and Parameters

Price \$5.00

# **THE PAPER TIGER™ IDS-460 IMPACT PRINTER**



Integral Data Systems, Inc.  
Milford, New Hampshire 03055

Part No. 9000-000-728  
Second Edition

April, 1981

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## SCOPE

This manual is intended for owners of the IDS-460 PAPER TIGER™ Impact Printer. Information on the IDS-460 Printer is provided in the following sections:

**Section 1, Characteristics and Specifications.** Provides a general description of the IDS-460 Printer and gives physical specifications, electrical specifications, and technical data.

**Section 2, Installation and Configuration.** Provides unpacking/repacking procedures, installation and configuration procedures, and interface descriptions for the IDS-460 Printer.

**Section 3, Operation.** Provides descriptions of all operator controls and indicators, gives procedures for operating the printer, and describes paper and ribbon handling procedures.

**Section 4, Optional Dot Plot Graphics.** Provides information for controlling dot plotting during the optional graphics mode of operation with the IDS-460 Printer.

**Section 5, Maintenance and Troubleshooting.** Provides operator preventive maintenance, adjustment procedures, troubleshooting hints, and a technical description of the control circuits in the IDS-460 Printer.

**Appendices A, B, C.** Provides reference diagrams, print samples, and a glossary of terms for use with the IDS-460 Printer.

*This manual is provided for information purposes only. All information contained within is subject to change without notice. Integral Data assumes no responsibility for any errors which may be contained within this document.*

## TABLE OF CONTENTS

<u>Paragraph</u>		<u>Page</u>
<b>SECTION 1 CHARACTERISTICS AND SPECIFICATIONS</b>		
1.1	GENERAL DESCRIPTION	1-1
1.2	PERFORMANCE FEATURES	1-1
1.3	PHYSICAL CHARACTERISTICS	1-1
1.4	MODULES	1-1
1.4.1	Controller Circuit Board	1-3
1.4.2	Power Supply Circuit Board	1-3
1.4.3	Ribbon Cartridge and Drive System	1-3
1.4.4	Print Head and Motor	1-3
1.4.5	Paper Drive System	1-3
1.5	TECHNICAL DATA	1-3
1.5.1	Dimensions	1-3
1.5.2	Weight	1-3
1.5.3	Clearances Required	1-3
1.5.4	Primary Power	1-3
1.5.5	Interfaces	1-4
1.5.6	Performance Specifications	1-4
1.5.7	Character Set	1-4
1.5.8	Ribbon	1-4
1.5.9	Paper	1-4
1.5.10	Diagnostics	1-6
1.6	OPTIONS AND ACCESSORIES	1-6
<b>SECTION 2 INSTALLATION AND CONFIGURATION</b>		
2.1	GENERAL	2-1
2.2	UNPACKING/REPACKING	2-1
2.2.1	Unpacking	2-1
2.2.2	Repacking	2-2
2.3	INSTALLATION PROCEDURE	2-3
2.3.1	Selection of Parallel or Serial Interface Configuration Strapping	2-3
2.3.2	Interface Cabling	2-3
2.3.3	115/230 VAC Power Selection	2-8
<b>SECTION 3 OPERATION</b>		
3.1	GENERAL	3-1
3.2	CONTROLS AND INDICATORS	3-1
3.3	OPERATING PROCEDURES	3-3
3.3.1	Manual (Switch Selectable) Operating Procedures	3-3
3.3.2	Software Controlled Operating Procedures	3-5
3.4	PAPER AND RIBBON HANDLING PROCEDURES	3-13
3.4.1	Loading Paper Into Printer	3-13
3.4.2	Setting Top of Form Position	3-14
3.4.3	Adjusting Left and Right Print Margins	3-14
3.4.4	Ribbon Replacement Procedure	3-15

SECTION 4 OPTIONAL DOT PLOT™ GRAPHICS

Paragraph	Page
4.1 GENERAL	4-1
4.2 GRAPHICS OPERATION	4-1
4.2.1 Graphics Control Codes	4-2
4.2.2 Bit Mapping	4-3
4.3 GRAPHICS CONSIDERATIONS	4-3
SECTION 5 MAINTENANCE AND TROUBLESHOOTING	
5.1 GENERAL	5-1
5.2 MAINTENANCE	5-1
5.2.1 Printer Cleaning and Lubricating	5-1
5.2.2 Mechanical Adjustment Procedures	5-1
5.2.3 Fuse Replacement	5-3
5.3 TROUBLESHOOTING	5-3
5.4 CONTROLLER/POWER SUPPLY TECHNICAL INFORMATION	5-6

APPENDIX A
CENTRONICS COMPATIBLE INTERFACE CABLE
APPENDIX B
PRINT SAMPLES ON THE IDS-460 PRINTER
APPENDIX C
GLOSSARY OF TERMS

LIST OF ILLUSTRATIONS

Figure	Page
SECTION 1 CHARACTERISTICS AND SPECIFICATIONS	
1-1 IDS-460 Impact Printer	1-1
1-2 Physical Characteristics	1-5
SECTION 2 INSTALLATION AND CONFIGURATION	
2-1 Unpacking/Repacking Requirements	2-2
2-2 DIP Strapping Platform	2-4
2-3 Parallel TTL Interface	2-5
2-4 Parallel Interface Timing	2-6
2-5 Serial EIA Interface, Printer to DCE Data Source	2-7
2-6 Serial EIA Interface, Printer to DTE Data Source	2-7
2-7 115/230 VAC Power Selection	2-8
SECTION 3 OPERATION	
3-1 Operator Controls and Indicators	3-2
3-2 Mode Select DIP Switches	3-4
3-3 ASCII Character Set and Control Codes	3-5
3-4 Paper Feed Path	3-12
3-5 Ribbon Guide Path	3-16
SECTION 4 OPTIONAL DOT PLOT™ GRAPHICS	
4-1 Bit Mapping	4-1
4-2 Print Head Scanning	4-2
SECTION 5 MAINTENANCE AND TROUBLESHOOTING	
5-1 Print Head Drive Belt Tension Adjustment	5-2
5-2 Paper Drive Belt Tension Adjustment	5-2
5-3 IDS-460 Power Supply Circuit Board Assembly Drawing	5-6
5-4 IDS-460 Controller and Power Supply Schematic	5-7
5-5 IDS-460 Controller Circuit Board Assembly Drawing	5-9

LIST OF TABLES

Table		Page
SECTION 1 CHARACTERISTICS AND SPECIFICATIONS		
1-1	Performance Features	1-2
1-2	IDS-460 Printer Options and Accessories	1-6
SECTION 3 OPERATION		
3-1	Operator Controls and Indicators	3-1
3-2	DIP Switches S4 and S3	3-4
3-3	Subset 1 ASCII Control Codes	3-6
3-4	Subset 2 ASCII Control Codes	3-6
3-5	Programming Functions and Parameters	3-10
SECTION 4 OPTIONAL DOT PLOT™ GRAPHICS		
4-1	Valid Graphics Control Characters	4-3
SECTION 5 MAINTENANCE AND TROUBLESHOOTING		
5-1	Troubleshooting Hints	5-4

SECTION 1  
CHARACTERISTICS AND SPECIFICATIONS

1.1 GENERAL DESCRIPTION

The IDS-460 PAPER TIGER™ Printer shown in Figure 1-1 is an intelligent, microprocessor based, dot matrix impact type printer. It uses a ballistic-type print head which interleaves two columns of print dots, forming high quality print characters. The standard character set includes true lower case descenders. The IDS-460 Printer is ideally suited for applications in business, text processing, science, industry, and personal computing.

1.2 PERFORMANCE FEATURES

Table 1-1 lists the performance features of the IDS-460 Printer.

1.3 PHYSICAL CHARACTERISTICS

The IDS-460 Printer is a table top unit with a removable top cover. Conventional fan-fold paper can be fed into the printer from the bottom or rear of the unit. An optional paper roller is available for holding a 4.5 inch diameter roll of pinfeed paper internal to the printer.

Operator controls and indicators protrude through the front of the top cover, offering convenience and accessibility. The power ON/OFF switch is on the printer rear panel; a 115/230 voltage select switch is located on the power supply circuit board under the cover.

1.4 MODULES

Five major modules function in conjunction with appropriate interface control signals to perform all printer operations. A general description of each module is provided in the following paragraphs. Figure 1-2 shows the locations of the modules within the printer.

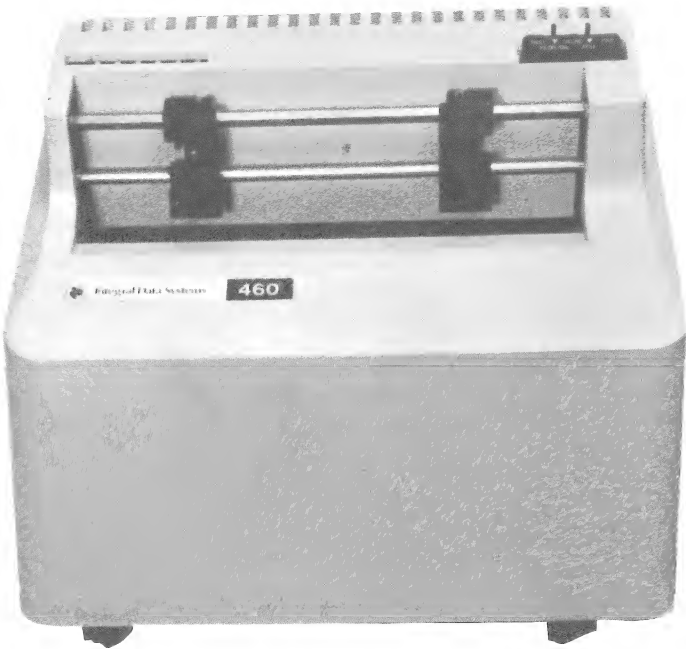


Figure 1-1  
IDS-460 Impact Printer

**Table 1-1**  
**Performance Features**

Feature	Description
Microprocessor Controller	Microprocessor based hardware/firmware architecture directly supervises and controls all print operations.
Built-In Self Test and Diagnostics	Automatic microprocessor memory self test on power-up; operator initiated repetitive test pattern.
Serial Parallel Interfaces	Serial RS-232-C, or Parallel TTL level interface (compatible with Centronics).
ASCII Character Set	Full 96 character upper and lower case ASCII character set with ASCII control characters used for printer control functions.
Selectable Character Format	Three selectable character pitches at print densities of 10, 12, and 16.8 characters per inch, respectively. Also, enhanced mode (double width) characters at each density.
Fixed Proportional Spacing	Software or switch selectable fixed or proportional spacing.
Text Justification	Software controlled left and right text justification.
Line Buffering	Automatic multiple line buffering.
Bidirectional Printing	Print head movement is logic-seeking bidirectional, for maximum printer throughput; unidirectional (left to right) printing in the optional graphics mode.
True Character Descenders	Character descenders are printed below character base line.
Selectable Line Spacing	Switch selectable line spacing of 6 or 8 lines per inch, plus software controlled line spacing in 1/48 inch increments.
Selectable Page Format	Top/bottom/left/right margin all software controlled to 1/48 inch vertical and 1/120 inch horizontal. Sixteen switch selectable power-on default formats.
Variable Line Length	Variable, up to 132 characters at 16.8 cpi fixed spacing. Maximum line length is 8 inches.
Programmable Functions	Programmable functions enable the operator to "custom configure" specific functions and print formats.
Graphics Mode (optional)	Optional dot plotting mode provides 84 x 84 dots per inch in graphics, using arbitrary patterns of printed dots under software control.
Ease of Operation	Operator accessible switches and indicators for off-line operation, and software controlled on-line operations provide control over all printer functions.
Maintainability	Built-in self test, plus modular construction allows rapid troubleshooting and repair/replacement of parts.

#### 1.4.1 Controller Circuit Board

The microprocessor based controller circuit board contains all electrical circuits necessary for interface, control and power signal distribution within the printer. Operator controls/indicators, mode and configuration select DIP switches, and strapping platforms are mounted directly on the board.

#### 1.4.2 Power Supply Circuit Board

The power supply circuit board contains all power supply electronics for the printer. It accepts primary AC power and supplies DC voltages to the controller board. It also contains the 115/230 VAC selector switch, and fuses for AC power and the 60 VDC supply.

#### 1.4.3 Ribbon Cartridge and Drive System

Ribbon is supplied in a convenient snap-in cartridge, and is driven by a DC motor. A twist in the ribbon forms a "mobius" loop, allowing both sides of the ribbon to be used, extending ribbon life. A biased ribbon path further extends ribbon life by allowing the full width of the ribbon to be used.

#### 1.4.4 Print Head and Motor

The print head has two vertical columns of print needles. The needles are positioned to print overlapping dots, increasing print quality.

A stepper motor moves the print head via a pulley and timing belt combination. Printing is accomplished by moving the print head across the paper, while pulsing specific needles to form printed characters.

#### 1.4.5 Paper Drive System

Paper is driven by a stepper motor and timing belt. The maximum slew rate is about 5.5 inches of paper per second.

### 1.5 TECHNICAL DATA

The following paragraphs provide technical data and specifications for the IDS-460 Printer. All specifications are subject to change without notice.

#### 1.5.1 Dimensions

The IDS-460 Printer is a tabletop unit measuring approximately 12.5 inches (31.75 cm) high, 15.75 inches (40 cm) wide, and 12.5 inches (31.75 cm) deep.

#### 1.5.2 Weight

The IDS-460 without any internal paper supply weighs approximately 25 pounds (9.3 kg).

#### 1.5.3 Clearances Required

The IDS-460 Printer has no drawers or sliding panels, and does not require clearances for such. However, ample space should be available at the top of the unit for access to operator controls and for forms loading. The user should also allow space at the rear of the unit for interface cable routing, access to the power ON/OFF switch, and use of the optional paper catcher.

#### 1.5.4 Primary Power

Primary power (115 VAC, 60 Hz or 230 VAC, 50 Hz) is selected by a switch on the power supply board.

### 1.5.5 Interfaces

Serial EIA RS-232-C or Parallel TTL level (which is functionally "Centronics" compatible) interfaces may be used. Cable interconnection is via a user supplied 25-pin female EIA (Cinch DB25S or equivalent) connector which plugs into J1 at the rear of the printer (under the cover). IDS offers several interface cables as accessory items (see Table 1-2).

### 1.5.6 Performance Specifications

**Serial Baud Rate:** Switch selectable data rates of 300, 1200, 2400, or 9600 bits per second (bps) are available. The 2400 bps rate can be changed to 110 or 4800 bps via a resistor change. Other rates may be special ordered. DIP switch selections provide for 1 or 2 stop bits, and odd, even, or no parity.

**Character Density:** 10, 12, or 16.8 characters per inch (cpi), plus enhanced (double width) characters of 5 cpi are switch selectable. Enhanced mode characters at all three densities are software selectable.

**Maximum Line Length:** 80, 96 or 132 characters across an 8 inch print width with fixed spacing at 10, 12, or 16.8 cpi, respectively. More when using selectable proportional spacing.

**Buffering Capabilities:** Automatic multiple line buffering of approximately 500 bytes in normal text mode is extended to 1500 bytes when the optional graphics mode is added.

**Lines Spacing:** Six or eight lines per inch (DIP switch selectable) plus line spacing in 1/48 inch increments under software control.

**Page Format:** Switch or software selectable. Eight power-on default page lengths of 3, 3.5, 4, 7, 8.5, 11, 12, and 14 inches are switch selectable as is a 0 or 1 inch perforation skip. Software control enables arbitrary top/bottom/left/right margins in 1/48th inch vertical and 1/120th inch horizontal increments.

**Programmed Functions:** Software control of the printer is accomplished by use of ASCII control characters. Functions include character density changes, fixed/proportional spacing, automatic text justification, line spacing size, page lengths, margin positions, double width characters, horizontal and vertical tabbing, and graphics data (optional).

### 1.5.7 Character Set

**Data:** Asynchronous bit serial: 1 start with 7 data plus 1 parity, and 1 or 2 stop bits. (Parity bits are checked for odd, even or none via DIP switch selection.)

**Print Format:** 24 x 9 dot matrix in normal mode, or 48 x 9 for enhanced mode. Upper case characters are 0.090 inch high. True descenders are printed for lower case characters and underscore.

**Coding:** Full 96 ASCII character set, upper and lower case.

**Optional Graphics Dot Plotting:** Full dot pattern control for optional graphics plotting. The option includes expanded buffering capabilities for both normal text mode and optional graphics mode. The graphics grid density is 84 x 84 overlapping dots/inch.

### 1.5.8 Ribbon

The printer uses a snap-in ribbon cartridge with a mobius loop 1/2 inch wide nylon ribbon. The ribbon's biased path and mobius loop allows the full width and both sides of the ribbon to be used, yielding expected ribbon life of more than 6 million characters.

### 1.5.9 Paper

The IDS-460 Printer will take pinfeed roll or fanfold paper, and up to six-part forms. The printer can use paper with a minimum width of 1.75 inches up to a maximum width of 9.5 inches (including pin-feed holes).

FRONT  
VIEW

TOP  
VIEW

REAR  
VIEW

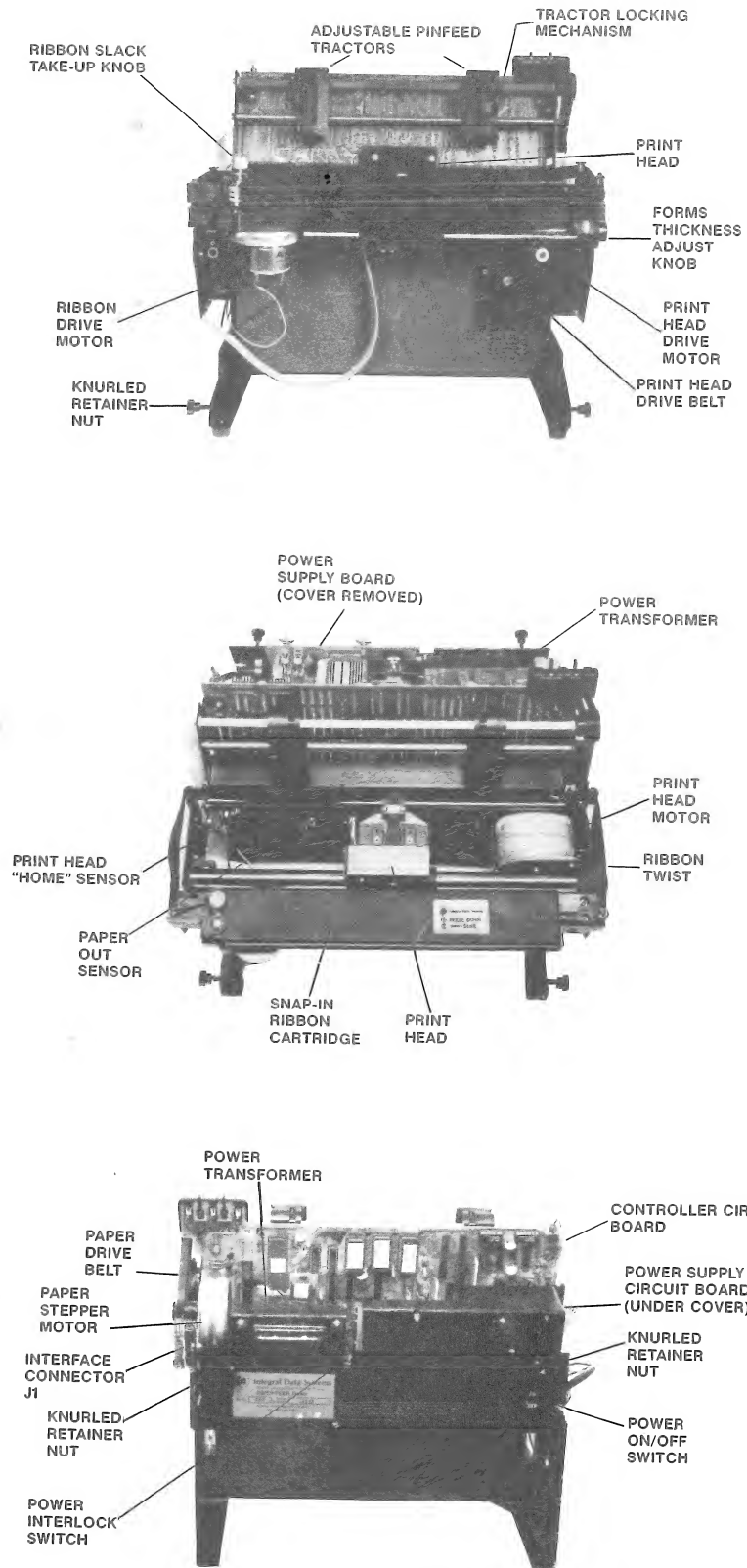


Figure 1-2  
Physical Characteristics

1.5.10 Diagnostics

- a. *Power-On Diagnostics:* Each time power is applied, a microprocessor memory test is performed automatically; a blinking fault light indicates an error.
- b. *Print Diagnostics:* Built-in operator initiated self-test provides for visual print quality checks and forms adjustment.

1.6 OPTIONS AND ACCESSORIES

IDS offers a number of options and accessories for the IDS-460 Printer. These are listed in Table 1-2 and can be purchased from your local IDS sales representative.

Table 1-2  
IDS-460 Printer Options and Accessories

Option Name	IDS Part No.	Description
Ribbon Cartridge	3710-000-743	Snap-in ribbon cartridge.
Tiger Trax™ Letter Carrier	3177-001-204	Allows printing of letters, etc. on single sheets.
Paper Catch Basket	3710-000-374	Collects printer output at rear of printer.
Parallel Interface Cable	3710-000-217	For Radio Shack TRS-80 Model 1.
Parallel Interface Cable	3710-000-465	For Apple Parallel Printer Interface.
Parallel Interface Connector	6036-001-210	Plug-to-plug compatible with Centronics cables.
Standard EIA Interface Cable	6037-000-377	EIA cable for connecting to DCE data source*.
Crossover EIA Interface Cable	6037-000-378	EIA cable for connecting to DTE data source*.
Graphics Dot Plotting with Expanded Buffering	—	Allows printing of illustrations, graphs, etc.
Internal Paper Roll Holder	3710-000-371	Holds 4.5 inch diameter paper roll.

\*Refer to paragraph 2.3.2.2 for DCE vs DTE interface configuration.

SECTION 2  
INSTALLATION AND CONFIGURATION

2.1 GENERAL

This section describes procedures to be used during installation and configuration of the IDS-460 Printer. This includes unpacking the printer, freeing the print head and ribbon cartridge for operation, configuring the printer for the appropriate interface, and setting the AC voltage select switch for the particular installation. Interface information is also included to assist in preparing the interface cable which is not supplied with the printer.

CAUTION!

*The controller board within the printer is static sensitive. Care should be exercised not to permit an electrical discharge directly to the board. Discharge static electricity by touching the printer frame before removing and installing the controller board.*

2.2 UNPACKING/REPACKING

2.2.1 Unpacking (See Figure 2-1)

The IDS-460 Printer is shipped from the factory as a completely assembled unit. Molded foam shock absorbing material protects the printer during shipment. It is recommended that all packaging and packing materials be retained indefinitely for use in any future equipment storage or shipment.

After unpacking the printer from its shipping carton and plastic bag, remove the cardboard base from the bottom of the printer. Loosen the four knurled retainer nuts which secure the printer top cover (see Figure 1-2), and carefully lift off the cover. Remove the two tubular head restraints (see Figure 2-1), one on each side of the head, that restrain the head during shipping. Also remove the plastic tie-down that holds the ribbon cartridge in place.

Visually inspect the unit for any obvious damage that may have occurred during shipment. Should any damage be found, save all packing material and contact the shipping agent or your local sales representative for assistance.

If it is necessary to return your printer to IDS, proper authorization must first be obtained. Contact:

Integral Data Systems, Inc.  
Customer Support Group  
Milford, New Hampshire 03055  
(603) 673-9100



## 2.2.2 Repacking (See Figure 2-1)

### CAUTION!

*You are responsible for packing the printer properly. Shipping companies will refuse payment for damage to an improperly packed printer.*

**When using original shipping materials**, remove the printer's cover, center the print head on the head rails and place a tubular head restraint on each side of the print head, over the front rail. Using the Forms Thickness Adjust Knob, move the print head back from the ribbon as far as it will go. Secure the ribbon cartridge in place using a plastic tie-down.

Replace the printer's cover and tighten the four knurled retaining nuts. Place rubber printer feet in the holes located in the cardboard base shipping plate, and place the unit in the plastic shipping bag. Slip the molded foam shock absorbing material over the top and bottom of the printer. Slide the printer into the shipping carton. Assure that the top of the printer is at the top of the shipping carton as indicated by the printing on the carton. Seal the carton with strong shipping tape.

**If the original shipping materials were not retained**, obtain a strong carton with a size of at least 17 inches x 17 inches x 21 inches. Do not use a carton any smaller.

Remove the printer's cover, then secure the print head to the left side of the frame with a plastic tie down. Secure the ribbon cartridge in place with a plastic tie down.

Tape a heavy piece of cardboard (cut to just fit the inside of your carton) beneath the base and rear opening of the printer. Place the printer in a heavy plastic bag and tape the bag closed.

Surround the printer with a packing material which cannot shift. Preferred packing materials are bubble pack and heavy pieces of foam rubber. Loose foam packing pellets or newspaper is unacceptable. Sufficient packing material must be used so that the printer cannot shift within the carton. Seal the carton with strong shipping tape.

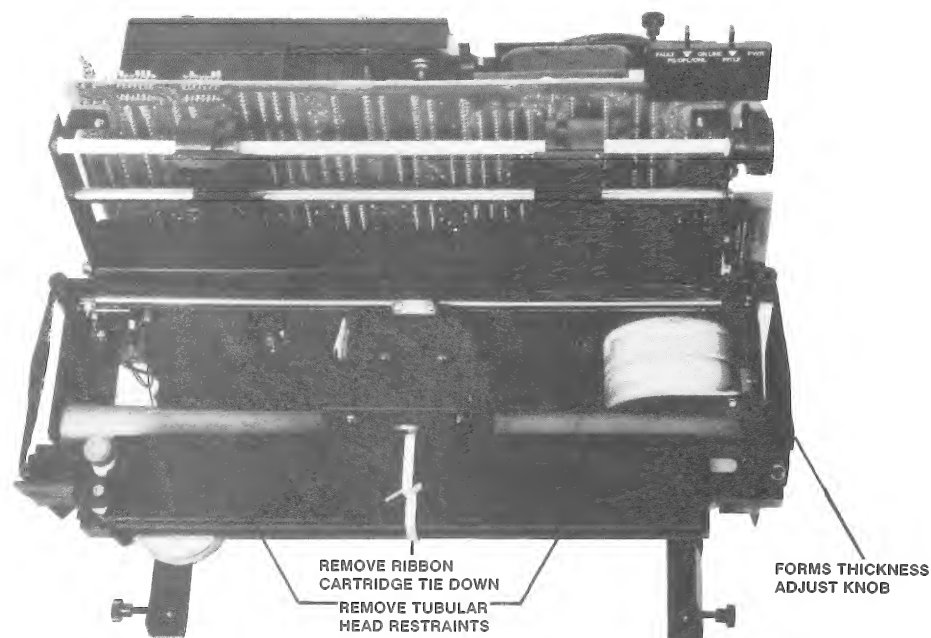


Figure 2-1  
Unpacking/Repacking Requirements

## 2.3 INSTALLATION PROCEDURE

Installation of the IDS-460 Printer is accomplished in three phases:

- Selection of Parallel or Serial Interface Configuration Strapping.
- Selection of Parallel or Serial Interface Cabling.
- Selection of 115 VAC or 230 VAC Power.

### 2.3.1 Selection of Parallel or Serial Interface Configuration Strapping

Selection of parallel or serial interface configuration strapping to meet the user's particular installation is accomplished by installing jumpers into a dip strapping platform (Z2) on the controller circuit board, next to interface connector J1 (see Figures 1-2 and 2-2). To do this, the user must:

- Check that the AC power cord is disconnected.
- Remove the printer cover by loosening the four knurled retainer nuts, then carefully lift off the cover.
- Locate the strapping platform (see Figures 1-2 and 2-2) on the controller circuit board.
- Configure the strapping as described in the following paragraphs.

**2.3.1.1 Parallel Interface Configuration Strapping.** The printer is shipped configured (see Figure 2-2) for a parallel TTL interface, with the printer Busy signal active on high and the Strobe signal active on the rising edge (see paragraph 2.3.2.1 for a discussion of these signals). For some applications, it may be necessary to invert one or both of these signals. This is accomplished on the strapping platform as follows:

- Check that jumper 7-8 is installed.
- To invert the Busy active signal, move the jumper from position 4-11 to position 5-10; tweezers or needle nose pliers may be helpful in moving the jumper.
- To invert the Strobe active signal, move the jumper from position 3-12 to 2-13.

**2.3.1.2 Serial Interface Configuration Strapping.** To configure the printer for a serial interface, remove the jumper from position 7-8; the other two jumpers may stay in place.

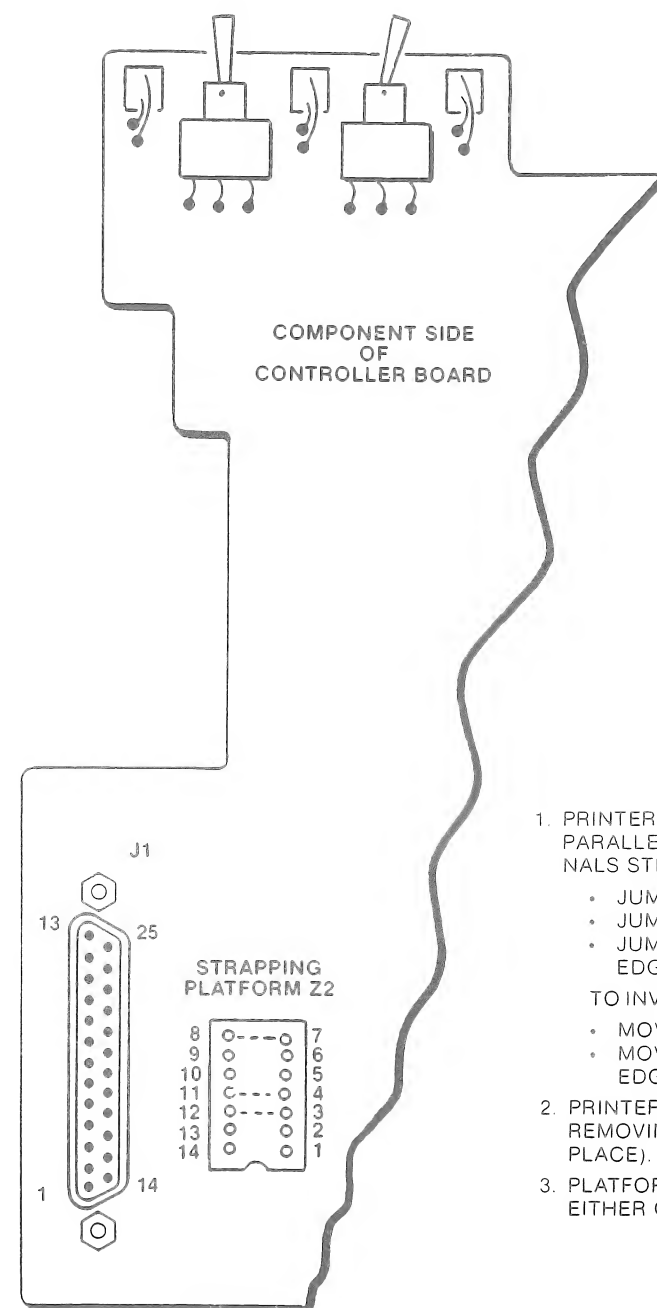
### 2.3.2 Interface Cabling

The IDS-460 Printer is connected to the host computer via a parallel or serial interface cable. The cable connects to connector J1 at the left rear of the printer, under the cover (see Figures 1-2 and 2-2).

Since many different interfaces exist, interface cabling is not provided as a standard item with the IDS-460 Printer; however, several types of interface cables may be purchased as option items (see Table 1-2) from your IDS sales representative.

A user supplied 25-pin female RS-232-C compatible connector can also be used to construct interface cabling. Refer to Figures 2-3, 2-4 and Appendix A for parallel interface cabling. Figures 2-5 and 2-6 show the serial interface cabling.

**2.3.2.1 Parallel Interface.** Figure 2-3 shows the cabling connections required for a parallel TTL interface. During normal operation, the data source monitors the Busy signal from the printer. When Busy is low, indicating the printer is ready to accept data, the data source places a 7-bit ASCII character on the data lines and strobes the printer's Strobe line (see Figure 2-4). On the positive edge of the Strobe, the printer raises the Busy signal to indicate it is no longer ready to receive another character. Busy will stay high until the printer is ready to accept the next character. At this time, the Busy signal will go low, and a negative going pulse will appear on the Acknowledge line. The following data strobe rising edge must not occur sooner than 5 microseconds after Busy has gone low.



#### NOTE

1. PRINTER IS SHIPPED WITH STRAPPING CONFIGURED FOR PARALLEL TTL INTERFACE (WITH STROBE AND BUSY SIGNALS STRAPPED FOR POLARITY): I.E.,
  - JUMPER 7-8 INSTALLED (PARALLEL INTERFACE)
  - JUMPER 4-11 INSTALLED (BUSY ACTIVE ON HIGH)
  - JUMPER 3-12 INSTALLED (STROBE ACTIVE ON RISING EDGE)
 TO INVERT BUSY ACTIVE AND/OR STROBE ACTIVE SIGNALS,
  - MOVE JUMPER 4-11 TO 5-10 (BUSY ACTIVE ON LOW)
  - MOVE JUMPER 3-12 TO 2-13 (STROBE ACTIVE ON FALLING EDGE)
2. PRINTER MAY BE CONFIGURED TO SERIAL EIA INTERFACE BY REMOVING JUMPER 7-8 (OTHER JUMPERS MAY STAY IN PLACE).
3. PLATFORM JUMPER POSITIONS 1-14 AND 6-9 ARE NOT USED IN EITHER CONFIGURATION.

Figure 2-2  
DIP Stripping Platform

#### NOTE

The Busy and Strobe signals strapping, as shipped from the factory, is configured for operation as shown in Figure 2-4. For some applications, it may be necessary to invert one or both of these signals (see paragraph 2.3.1.1 for details).

Four additional status signals are also present at the parallel interface to indicate the printer's operational status to the data source. Pin 4 (On-line) remains high while the printer is on-line. Pin 18 (Fault) is forced low when the printer is off-line, out of paper, or if a memory or checksum error was detected during power-up. Pin 23 (Enabled) is high if the remote control select feature has not deselected the printer. This signal goes high upon receiving a DC1 control character and goes low upon receiving a DC3 control character. Pin 24 (Paper Out) is high whenever the printer is out of paper.

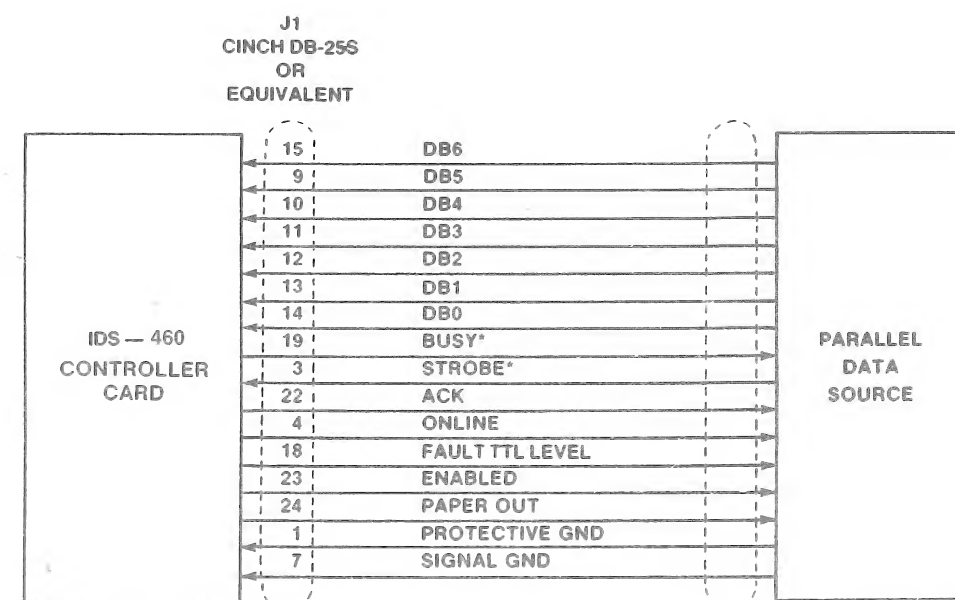
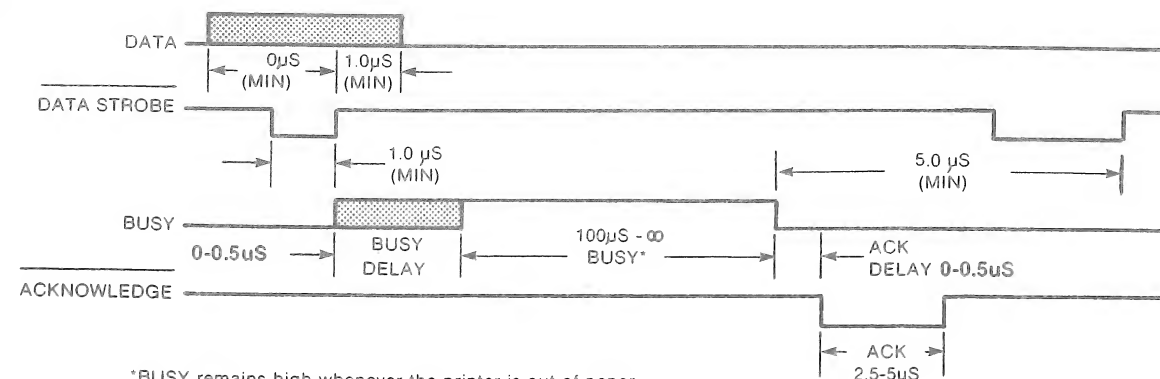


Figure 2-3  
Parallel TTL Interface





**Figure 2-4**  
Parallel Interface Timing

NOTE  
Timing shown reflects the signal strapping configuration as shipped from the factory (see Figure 2-2).

**2.3.2.2 Serial EIA RS-232-C Interface.** Figure 2-5 shows the cabling connections for a serial EIA interface. It is normally configured with the printer as the DTE (Data Terminal Equipment) source, accepting serial Received Data from the DCE (Data Communications Equipment) source. The printer uses Data Terminal Ready (DTR) to control the flow of received data to prevent data overflow conditions. This is accomplished by dropping DTR whenever the printer buffer is nearly filled, temporarily inhibiting Received Data flow until the buffer is able to accept additional data.

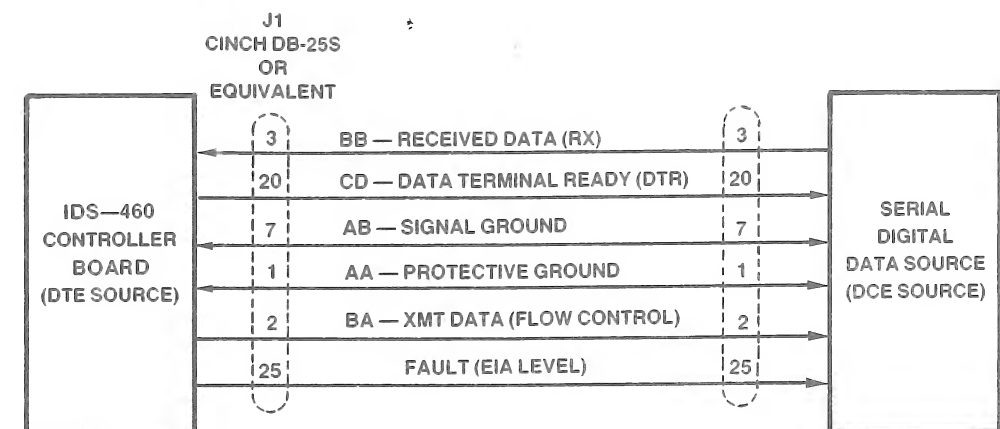
The IDS-460 Printer also conforms to industry standards for flow control; i.e., it uses the XMT DATA line to send Control-Q (XON) to the data source when its receive buffers are able to accept Received Data. Conversely, it sends Control-S (XOFF) to temporarily inhibit data flow.

Pin 25 (Fault) is forced to a logic high (+5 volts) whenever the printer is off-line, out of paper, or if an error condition is detected.

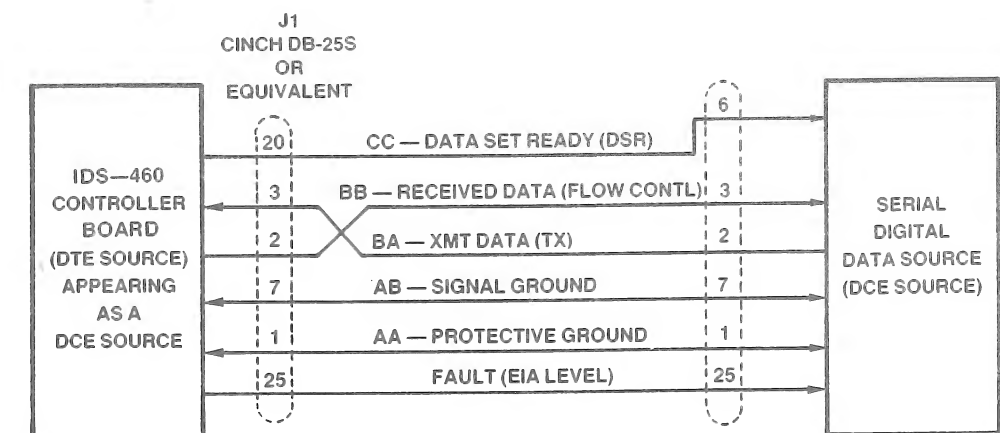
In some installations it may be necessary to interface the printer to a data source that is configured as a DTE rather than DCE (see Figure 2-6). In such a configuration interface signals DTR, Received Data, and Send Data are rerouted in a "cross-over" cable. These signal crossovers cause the printer to appear as a DCE, sending signal Data Set Ready (DSR) to the DTE data source to regulate transmit data.

**NOTE**

Some installations will not require Transmit Data, Protective Ground, and Fault. The IDS-460 Printer frame and logic ground are tied directly to the third prong (AC protective ground lead) on the AC plug.



**Figure 2-5**  
Serial EIA Interface  
Printer to DCE Data Source



**Figure 2-6**  
Serial EIA Interface  
Printer to DTE Data Source

### 2.3.3 115/230 VAC Power Selection

The 115/230 VAC select switch is located on the power supply circuit board, under the power supply board cover (see Figure 2-7). To select either voltage, proceed as follows:

#### NOTE

*Ensure that the AC power cord is disconnected from the power source before selecting power.*

- Remove the power supply board cover by pinching each dual locking spacer, then pull the cover forward and up.
- To select 115 VAC, slide the switch away from the power transformer (use an offset screwdriver).
- To select 230 VAC, slide the switch toward the power transformer.
- Install the power supply board cover.
- Install the printer cover and tighten the four knurled retainer nuts.

The printer is now configured for operation.

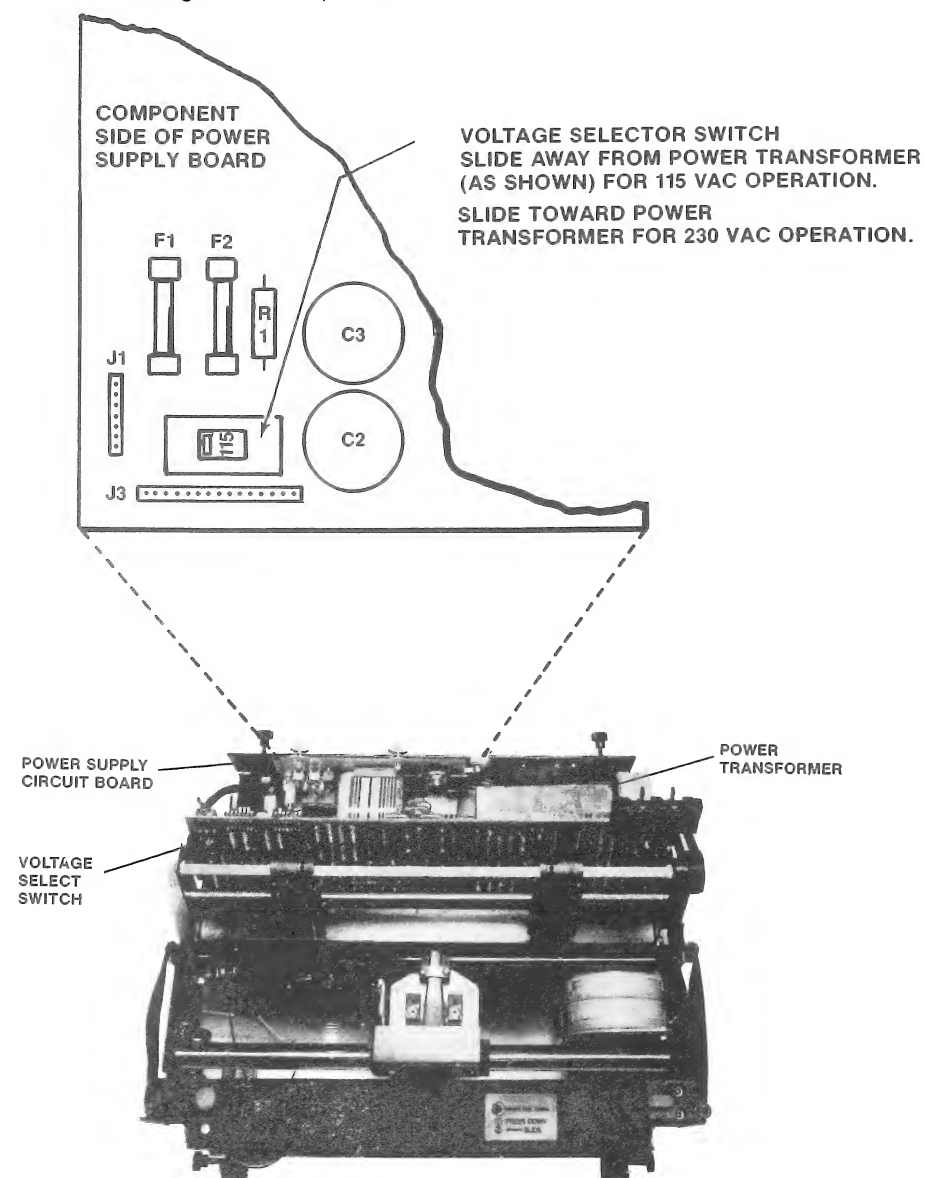


Figure 2-7  
115/230 VAC Power Selection

## SECTION 3 OPERATION

### 3.1 GENERAL

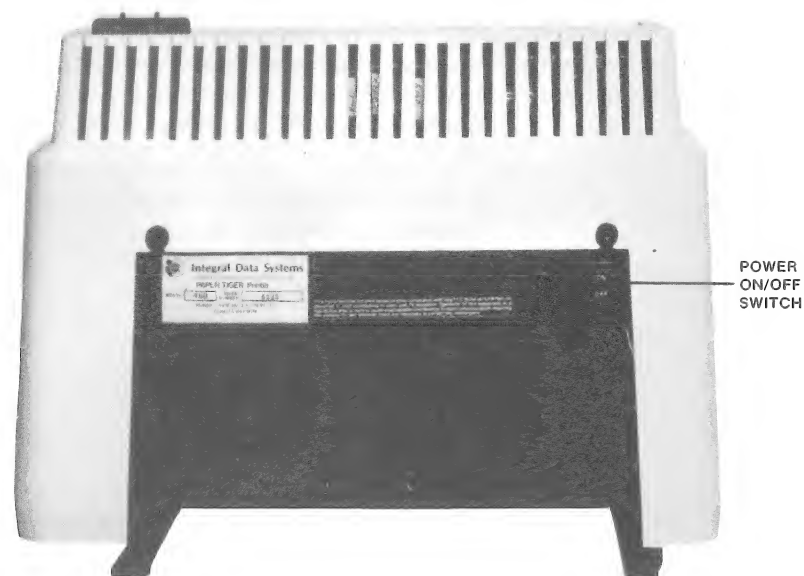
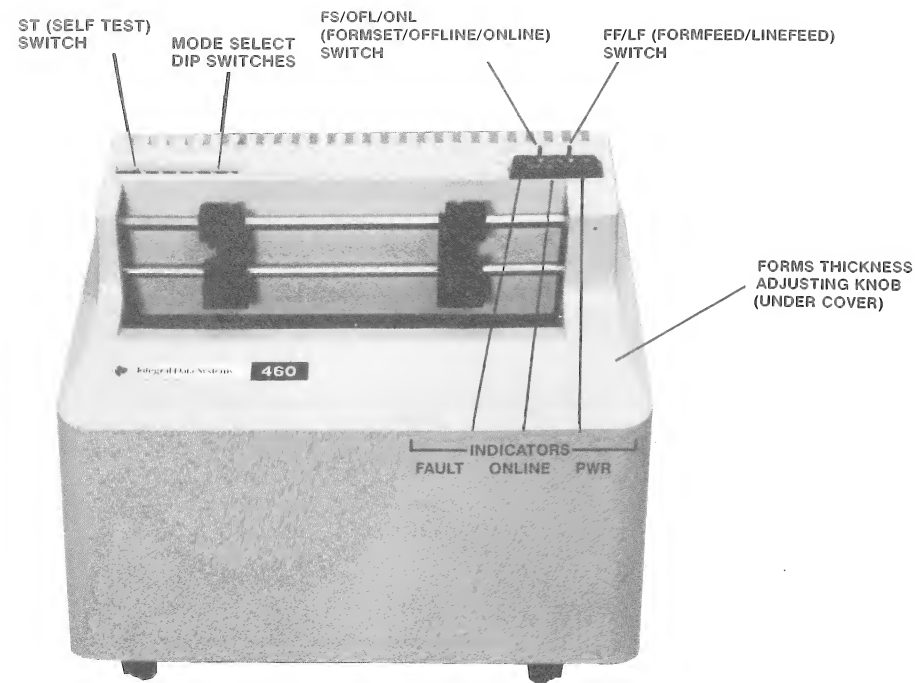
This section describes the controls and indicators of the IDS-460 Printer, gives procedures for operating the printer in the text mode, and includes instructions for paper and ribbon handling. Operational procedures for the optional graphics mode are included in Section 4.

### 3.2 CONTROLS AND INDICATORS

Table 3-1 lists and describes all operator controls and indicators. Figure 3-1 shows the location of all controls and indicators. The user should become totally familiar with all controls and indicators before operating the printer.

Table 3-1  
Operator Controls and Indicators

Control/Indicator	Description
Mode Select DIP Switches S4 and S3	Two, 7-position switches used to select various printer operating modes. (Some settings can be redefined via programmable software control commands.)
ON/OFF Power Switch	Controls AC power to the printer.
ST (Self Test) Two-Position Switch	Active only when the printer is offline. Momentarily switching to the right, then back to the left clears the printer buffer. If the switch is set to the right, the buffer is cleared and a repetitive test pattern of all 96 print characters is printed out.
FS/OFL/ONL (Formset/Offline/Online) Three-Position Switch	The ONL position places the printer on-line to receive and print data. The OFL position takes the printer offline to ignore incoming data, allowing adjustment of paper or forms. The FS position (used in conjunction with the FF/LF switch) allows form positioning.
FF/LF (Form Feed/Line Feed) Three Position Momentary Contact, Return-To-Center Switch	Positions paper vertically by two methods: 1. With the FS/OFL/ONL switch set at OFL, paper will be lined when the FF/LF switch is positioned to LF and formed when the switch is positioned to FF. 2. With the FS/OFL/ONL switch set to FS, paper will be incrementally moved up when the FF/LF switch is positioned to LF and down when positioned to FF, to establish top of form positioning.
FLT (Fault) Indicator	Illuminates when the printer is out of paper. Flashes on and off, along with the ONL (online) indicator, if a random access memory error is detected during printer turn-on.
ONL (Online) Indicator	Illuminates when the printer is switched online. Flashes on and off if a read-only memory error is detected during printer turn-on. Flashes on and off, along with the FLT indicator, if a random access memory error is detected.
PWR (Power) On Indicator	Illuminates when power is applied to the printer.
Forms Thickness Adjust Knob	When rotated, moves the print head towards or away from the paper to provide optimum print quality.



NOTE  
115/230 VAC SELECT SWITCH AND LINE FUSE LOCATED ON POWER  
SUPPLY BOARD INSIDE PRINTER (SEE FIGURE 2-7).

Figure 3-1  
Operator Controls and Indicators

### 3.3 OPERATING PROCEDURES

The IDS-460 Printer can be operated through the manually set DIP switches, through a combination of DIP switch settings and ASCII control codes, through user programming, or through a combination of all. Procedures for each are included in the following paragraphs.

#### 3.3.1 Manual (Switch Selectable) Operating Procedures

The following gives a step-by-step procedure for power-up, self-test, and manual (switch selectable) operation of the printer:

- Check that the printer is properly installed, configured for parallel or serial operation, and set for the proper input voltage (see Section 2).
- Check that paper is loaded (see paragraph 3.4.1).
- Set the two 7-position DIP switches (S3 and S4) per Table 3-2 and Figure 3-2; use a narrow, blunt object (such as a ball point pen) to set switches.

#### NOTE

*All DIP switch settings must be set before turning power on. Changing the settings after the power is on will not alter the operational state of the printer. The printer must be turned off before resetting any switch selection.*

- Position the FS/OFL/ONL switch to OFL (offline).
- Position the ST (self test) switch to the left.
- Connect the AC power cord to the power source.
- Position the Power ON/OFF switch to ON; the PWR on indicator will light.
- To run print test pattern, position ST switch to the right. Printer will print repetitive test pattern of all 96 print characters for as long as the ST switch is positioned to the right.
- Observe print quality of the test pattern. If printing is too light, move the print head closer to the paper. If print is smudging, move the print head back. To adjust the print head, remove printer cover and rotate Forms Thickness Adjusting Knob. Ribbon and printer head life will be extended at lighter settings.

#### NOTE

*Power is disconnected from the printer (via power interlock switch) whenever the printer cover is removed.*

- Establish top of form positioning (see paragraph 3.4.2).
- Adjust left and right margins (see paragraph 3.4.3).
- Position FS/OFL/ONL switch to ONL (online); ONL indicator will light.

#### NOTE

*If the ONL indicator flashes on and off, the printer's built-in microprocessor memory test diagnostics are indicating a read-only memory error. If the ONL and FLT indicators are both flashing, the diagnostics are indicating a random access memory error. Refer to Section 5 for corrective action.*

- The printer is now ready to receive and print data.

Table 3-2  
DIP Switches S4 and S3

DIP S4		DIP S3	
SW1-SW2*	Selects a character print density of 10, 12, or 16.8 cpi. Also, enhanced (double width) density of 5 cpi.	SW1-SW3*	Selects one of eight available page lengths from 3 to 14 inches.
SW3*	Selects line spacing at either 6 or 8 lines per inch.	SW4-SW5	Selects data rate of incoming serial digital data as 300, 1200, 2400, or 9600 baud.
SW4	Enables or disables automatic 1-inch skip at form boundaries. (Skip is programmable; see paragraph 3.3.2.3).	SW6-SW7	Defines parity checking functions for data characters received in serial mode.
SW5	Enables or disables an automatic line feed upon receiving a (CR) carriage return control character.		
SW6*	Selects character spacing as fixed or proportional.		
SW7	Enables or disables expanded software control functions as described in paragraph 3.3.2.2.		

\*Switch settings which may be redefined via software control codes.

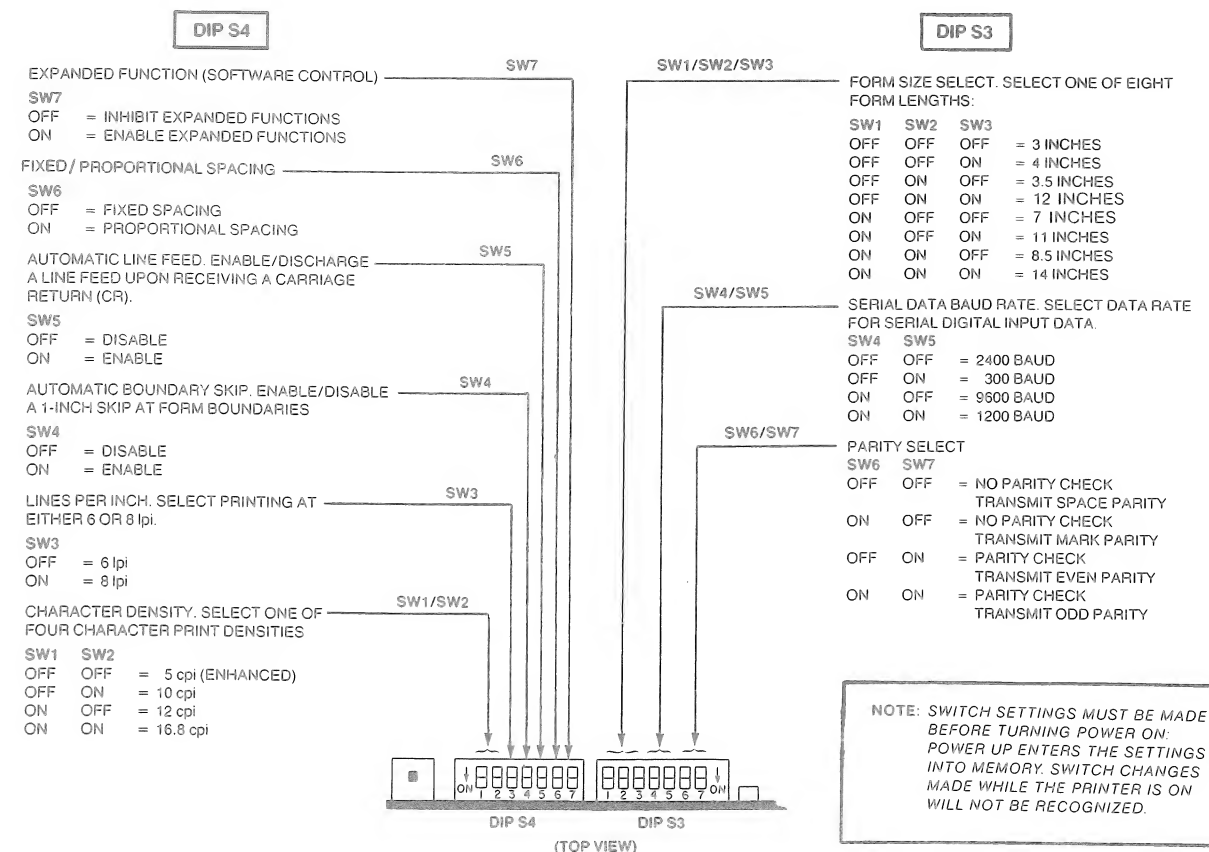


Figure 3-2  
Mode Select DIP Switches

### 3.3.2 Software Controlled Operating Procedures

The IDS-460 Printer uses the ASCII character set for its standard print character format. The printer also recognizes and decodes certain ASCII control codes for expanded printer control functions. Further, the printer can be programmed via the user's computer to perform additional control functions. Descriptions of all printable characters, ASCII control codes, and programmable functions are provided in the following paragraphs.

**3.3.2.1 Standard ASCII Character Set and Control Codes.** Figure 3-3 shows the 96 standard ASCII characters that can be printed, plus all ASCII control codes. Note that many of the control codes require the printer Expanded Function DIP switch (DIP S4, SW7) to be On so that they may be recognized.

The decimal value of any ASCII character may be determined by adding the decimal row and column values of that ASCII character. The two digit hexadecimal value for each ASCII character can be read directly.

		Hexadecimal MSB							
		0	1	2	3	4	5	6	7
Hexadecimal LSB	Decimal Row	0	16	32	48	64	80	96	112
		0	16	32	48	64	80	96	112
0	0	NUL	DLE	SP	0	@	P		p
1	1	SOH	DC1	!	1	A	Q	a	q
2	2	STX	DC2	"	2	B	R	b	r
3	3	ETX	DC3	#	3	C	S	c	s
4	4	EOT	DC4	\$	4	D	T	d	t
5	5	ENQ	NAK	%	5	E	U	e	u
6	6	ACK	SYN	&	6	F	V	f	v
7	7	BEL	ETB	'	7	G	W	g	w
8	8	BS	CAN	(	8	H	X	h	x
9	9	HT	EM	)	9	I	Y	i	y
A	10	LF	SUB	*	:	J	Z	j	z
B	11	VT	ESC	+	;	K	[	k	
C	12	FF	FS	,	<	L	\	l	:
D	13	CR	GS	-	=	M	]	m	
E	14	SO	RS	.	>	N	^	n	
F	15	SI	US	/	?	O	_	o	del

ASCII  
Control Codes

96 Character  
ASCII Set

Figure 3-3  
ASCII Character Set and Control Codes

**3.3.2.2 Printer Control Functions.** The ASCII control codes to which the IDS-460 Printer can respond are divided into two subsets, as listed in Tables 3-3 and 3-4. Printer response to either subset is determined by the position of the Expanded Function DIP Switch (DIP S4, SW7 as shown in Figure 3-2).

If the Expanded Function DIP Switch is set to its Off position when power is applied to the printer, response will be limited to only the three control codes listed in Table 3-3. Conversely, if the DIP Switch is On, the codes listed in Table 3-4 will be enabled. (If the Expanded Function DIP Switch is Off when the printer is powered up, the optional graphics mode is disabled along with the other expanded functions.)

**Table 3-3**  
**Subset 1 ASCII Control Codes**  
**(Expanded Function DIP Switch Off)**

Control Code	Decimal Code	Hexadecimal Coding	Terminal Keyboard	Function
LF	10	OA	Line Feed or CTRL-J	Line Feed. Printer performs a carriage return, and advances paper one line.
FF	12	OC	CTRL-L	Form Feed. Printer advances paper to top of form on next page.
CR	13	OD	Return or CTRL-M	Carriage Return. Printer performs a carriage return to same line. If auto line feed is enabled, a linefeed is also performed.

**Table 3-4**  
**Subset 2 ASCII Control Codes**  
**(Expanded Function DIP Switch On)**

Control Code	Decimal Code	Hexadecimal Code	Control Code	Function
SOH	01	01	CTRL-A	<b>ENHANCED MODE</b> Causes the printer to enter the ENHANCED mode. All characters printed while in this mode will be double width.
STX	02	02	CTRL-B	<b>NORMAL MODE</b> Causes the printer to revert back to NORMAL print mode. Characters will be printed normal size after this command is issued.
ETX	03	03	CTRL-C	<b>GRAPHICS MODE (OPTIONAL)</b> Causes the printer to switch to graphics mode. See Section 4 for further information.
EOT	04	04	CTRL-D	<b>JUSTIFY ON</b> Causes the printer to enter the text justify mode. The printer will automatically stretch and shrink the length of the printed line to square off both the left and right margins. The user must send all text to be justified as a single line without carriage returns or linefeeds. The printer breaks this text at word boundaries to form lines as required. The user should terminate his text (actually a paragraph) with the usual carriage return-linefeed combination. This signals the printer to push any remaining text to the left-margin and not attempt to spread it across the last line.

**Table 3-4**  
**Subset 2 ASCII Control Codes**  
**(Expanded Function DIP Switch On)**  
**(Continued)**

Control Code	Decimal Code	Hexadecimal Code	Control Code	Function
ENQ	05	05	CTRL-E	<b>JUSTIFY OFF</b> This turns off text justification.
ACK	06	06	CTRL-F	<b>FIXED SPACING</b> Select fixed spacing as opposed to proportional spacing. Fixed or proportional spacing can also be selected at power up with the DIP switches (paragraph 3.3.1).
HT	09	09	CTRL-I	<b>HORIZONTAL TAB</b> The printer will tab to the next available horizontal tab position; if there is no tab position available, or none were programmed (paragraph 3.3.2.3) this code will be ignored.
LF	10	OA	CTRL-J	<b>VERTICAL ADV-1 AND CR (LINE FEED)</b> Printer performs a carriage return and vertical advance-1.
VT	11	OB	CTRL-K	<b>VERTICAL TAB</b> The paper will be slewed to the next vertical tab position; if there is no other vertical tab position left or none were programmed, this code will be ignored.
FF	12	OC	CTRL-L	<b>FORM FEED</b> This code causes the paper to be slewed to the top of the next form.
CR	13	OD	CTRL-M	<b>CARRIAGE RETURN</b> The printer performs a carriage return to the beginning of the current line. If the "Auto Line Feed" DIP switch was on during power up of the printer, a vertical advance-1 (Linefeed) will also be performed.
SO	14	OE	CTRL-N	<b>VERTICAL ADV-2 AND CR</b> The printer performs a carriage return and vertical advance-2.
DLE	16	10	CTRL-P	<b>PROPORTIONAL SPACING</b> This code enables proportional spacing to take place. The printer will automatically perform inter-character proportional spacing to enhance the appearance of the printed text. Combined with the automatic text justification mode, a page of text printed on this printer looks much like that of a book. It should be noted that character positions become variable in this mode, so it will be difficult for the host computer to know exactly where on a printed line a particular character is printed. Also, since proportional spacing actually shrinks the length of a line, it may be necessary to add the number of characters sent for each line printed using this mode. The proportional spacing mode is exited by selecting the FIXED spacing mode.



Table 3-4  
Subset 2 ASCII Control Codes  
(Expanded Function DIP Switch On)  
(Continued)

Control Code	Decimal Code	Hexadecimal Code	Control Code	Function
DC1	17	11	CTRL-Q	<b>SELECT PRINTER</b> This code causes the printer to be selected, that is, print the data coming in on the interface. This condition is the opposite of that caused by the deselect code, DC3.
DC2	18	12	CTRL-R	<b>VERTICAL ADV-1 W/O CR</b> This command moves the paper the amount specified by vertical advance-1.
DC3	19	13	CTRL-S	<b>DESELECT PRINTER</b> This code deselects the printer. The printer will ignore all incoming data until a DC1 code is received.
DC4	20	14	CTRL-T	<b>VERTICAL ADV-2 W/O CR</b> This command moves the paper the amount specified by vertical advance-2 without a carriage return.
EM	25	19	CTRL-Y	<b>VERTICAL ADV-3 W/O CR</b> The printer will move the paper the amount specified by vertical advance-3, without a carriage return.
ESC	27	1B	CTRL-[	<b>PROGRAMMING ENABLE-ESCAPE</b> This is the escape code for printer programming (see paragraph 3.3.2.3).
GS	29	1D	CTRL-]	<b>PRINT DENSITY 10 CPI</b> Selects print density of 10 characters per inch.
RS	30	1E	CTRL-↑	<b>PRINT DENSITY 12 CPI</b> Selects print density of 12 characters per inch.
US	31	1F	CTRL-—	<b>PRINT DENSITY 16.8 CPI</b> Selects print density of 16.8 characters per inch.

**3.3.2.3 Programming Control Functions.** The IDS-460 Printer allows user programming of up to eight horizontal and vertical tabs, forms length, left and right margins, intercharacter spacing, and three separate vertical advances. Additionally, the print head and paper can be precisely positioned by use of similar control sequences.

Table 3-5 lists the various printer parameters that can be programmed. The command format is generally the same for all commands, as shown below:

**ESC code, Command Character, Argument 1, Argument 2, ...Argument N, Terminator.**

Where: **ESC code** =ASCII ESCAPE Character (from Figure 3-3 or Table 3-4).

**Command Character** =Command Character (from Table 3-5).

**Argument Value** =A decimal number in 1/120 inch for horizontal parameters and 1/48 inch for vertical parameters.

**Terminator** =Any non-numeric character such as a carriage return or \$.

**Separators** =Parameters may be separated by spaces or commas. No separator is required between the ESC code and command character.

A typical sequence using BASIC might be:

```
10 PRINT CHR$(27);"F,120,240,360,480,600,$"
```

The above statement would program horizontal tabs at 1, 2, 3, 4, and 5 inches from the left margin. A "\$" was used to terminate the command. This arbitrary character was selected because it will show in listings. It will not normally be printed since it is part of the command string.

If the printer finds a problem within a command line, the part of the command not processed due to the error will be printed. For instance, if the ASCII escape code was garbled, the printer would print:

```
F,120,240,360,480,$
```

since it did not consider this data part of a valid command sequence.

**Table 3-5**  
**Programming Functions and Parameters**

Programmed Function	Command Character	No. Argument Fields	Argument Units	Default Values
Set Vertical ADV-1	B	1	1/48 inch	If DIP switch set to 6 lpi, default =8 units (8/48 inch). If DIP switch set to 8 lpi, default =6 units (6/48 inch).
Set Vertical ADV-2	C	1	1/48 inch	4 units (4/48 inch).
Set Vertical ADV-3	D	1	1/48 inch	-4 units (reverse 4/48 inch).
Set Vertical Tabs	E	1-8	1/48 inch	0 units
Set Horizontal Tabs	F	1-8	1/120 inch	0 units
Set Absolute Horizontal Position	G	1	1/120 inch	Set Head position relative to left margin.
Set Absolute Vertical Position	H	1	1/48 inch	Set Vertical position relative to top of form.
Set Right/Left Margins	J	2	1/120 inch	—
Set Form Size	L	2	1/48 inch	Per DIP switch setting.
Set Absolute Line	M	1	—	—
Set Horizontal Character Position	N	1	—	—
Set Intercharacter Spacing Increment	P	1	1/24 char. width	0 units

**Vertical Advance Programming.** Three separate vertical advances may be programmed. Vertical Advance-1 is used whenever a linefeed code is sent to the printer. It is set according to the number of lines per inch selected by the DIP switches during power up. Vertical Advance -2 is defaulted to a value of 4 (1/12 of an inch). This is equivalent to a "graphics" linefeed or subscript. Vertical Advance-3 defaults to a value of -4, which can be used for a superscript. (After the superscript is printed, vertical Advance-2 will return the paper to the base line.) It is not possible to reverse the paper direction past the top of the current form. For example, if the printer was just sent a top of form command, and vertical Advance-3 was issued, no paper motion would take place.

The command characters (from Table 3-5) used to program the three vertical advances are listed below:

Advance-1 (Line feed) B  
Advance-2 (+ 1/12) C  
Advance-3 (- 1/12) D

The vertical advances can be programmed with the following BASIC command sequence. The example shown will program Advance-1 to provide linefeeds of 1 inch. The other advances can be programmed by substituting the command character for the letter B and the desired advance in the command line:

```
10 PRINT CHR$(27);"B,48,$"
```

Reverse paper advances (toward top of the page) are sent as negative numbers (precede each with a minus sign). Once programmed, the advances may be tested by sending the appropriate control code for that function; i.e., CHR\$(10) (a line feed) for Advance-1, CHR\$(14) (an ASCII SO character) for Advance-2, and CHR\$(25) (ASCII EM character) for Advance-3.

**Vertical and Horizontal Tab Programming.** Up to eight vertical and horizontal tabs may be programmed. Vertical tabs are measured in 1/48th inch units, and horizontal tabs in 1/120ths. When programming tabs, the user is expected to send the settings in ascending numeric order. Any setting which is less than the previous value will be ignored. Previously set tabs will be automatically cleared when a new tab set command is received. Tab settings are relative to home (left-most head position) horizontally, and top of form vertically. The command line for setting horizontal and vertical tabs is identical except for the command letter:

```
10 PRINT CHR$(27);"E,48,240,288,336,$" Sets vertical tabs at 1,5,6 and 7 inches.  
10 PRINT CHR$(27);"F,120,240,360,$" Sets horizontal tabs at 1,2 and 3 inches.
```

The printer will move the paper to the next vertical tab position (measured from the top of the current form) upon receipt of a VT [CHR\$(12)] command, and position the head to the next horizontal tab position when a HT [CHR\$(9)] is received.

If no tabs are set these codes will be ignored. The user should insure that the right margin has been set prior to setting tabs or, if this is not the case, then the right margin should be set to a value greater than the right-most tab value. Similar precautions should be exercised for vertical tab and form size settings.

Tabs may be cleared by setting a single tab to 0. For example:

```
10 PRINT CHR$(27);"E,0,$" Clears vertical tab.  
10 PRINT CHR$(27);"F,0,$" Clears horizontal tab.
```

If tabs are set two or more times, only the most recent settings are recognized. All previously entered tab settings are discarded.

**Left and Right Margins Programming.** Both the left and right margins can be programmed by the following BASIC command line:

```
10 PRINT CHR$(27);"J,120,600,$"
```

The first argument sets the left margin, the second sets the right. This line will set the left margin one inch from home (left-most head position), and the right margin five inches from home, yielding a print line of four inches total length. If only the left margin is to be adjusted, only one argument need be given. Care should be taken to insure that the margins are set prior to setting horizontal tabs.

When the printer is first powered up the margins settings default to 0, 960. The zero represents the Home (left-most printable position) and 960 corresponds to the right-most printable position.

**Form Length Programming.** The IDS-460 Printer allows form lengths to be set to standard values via the DIP switches, or programmed to nearly any practical size with the following BASIC command line:

```
10 PRINT CHR$(27);"L,384,336,$"
```

The first argument in the above command sets the physical size of the form to 8 inches. The second argument sets the amount of printable space on the form to 7 inches. Argument 2 must always be less than Argument 1 or the command will be ignored. This allows skip space for the printer when the auto page skip option is enabled.

**Intercharacter Spacing Programming.** It is possible to program the amount of space between characters. This spacing is measured in 1/24ths of a character width. A nominal character width is determined by the current character density. For instance, 10 characters per inch gives 1/240 inch increments in fixed spacing. The following BASIC command sequence will increase intercharacter spacing by 1/2 a character width:

```
10 PRINT CHR$(27);"P,12,$"
```

This command should be used only when the printer is in the fixed spacing mode. Unpredictable or erratic spacing may occur if it is used with proportional spacing.

**Absolute Print Head and Paper Positioning.** Provision has been made to allow both the print head and paper to be positioned to an absolute position relative to the home position horizontally, and top of form vertically. As always, horizontal units are in 1/120ths of an inch, vertically in 1/48ths. The following BASIC command lines will position the head 6 inches from the home position, and the paper 3 inches down from the top of the current form.

```
10 PRINT CHR$(27);"G,720,$"; Position head 6 inches from home position. Note semicolon to
    prevent a carriage return from being sent from BASIC.
10 PRINT CHR$(27);"H,144,$"; Move the paper to 3 inches below top of form.
```

These commands are effective bi-directionally; that is, they will execute the required motion from any point on the line or form, reverse feeding paper as necessary. Care should be taken to make sure that paper so moved does not bind or jam.

**Absolute Line and Character Positioning** This command allows random access to any line or character position on a given form. The command sequence is:

```
10 PRINT CHR$(27);"M,17,$" Move paper to the 17th line in the current form using current line
    spacing.
10 PRINT CHR$(27);"N,35,$" Move the head to the 35th character position on the line, based
    on the current print density (characters per inch).
```

This command can be used to provide a fixed amount of indentation for proportionally spaced text, or to index to any character position printed with fixed spacing. Proportionally spaced characters are positioned according to the length of the line and character widths, and so cannot be indexed accurately with this command.

The top line of a form is line 0 and the left most character of a line is character 0.

Like the absolute positioning command described above, paper will be reverse fed if required to move it to the current position. Care should be taken to see that it does not bind or jam under these conditions.

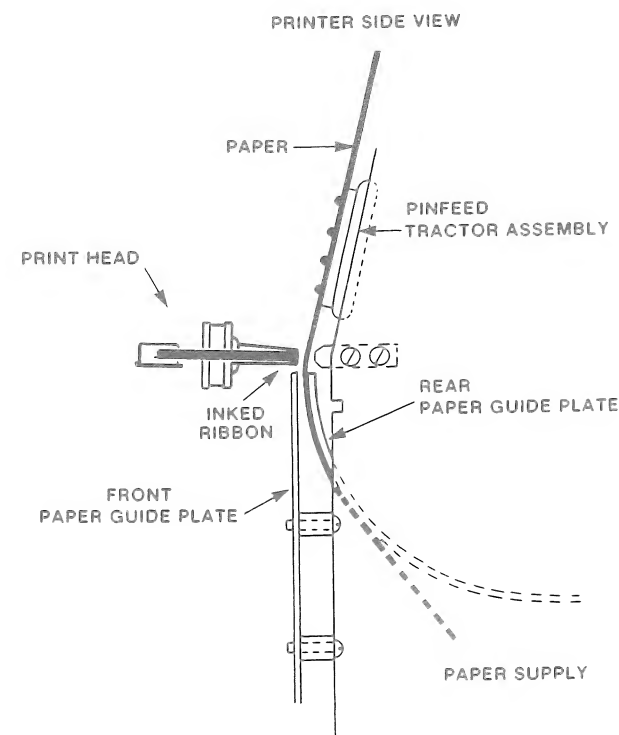


Figure 3-4  
Paper Feed Path

### 3.4 PAPER AND RIBBON HANDLING PROCEDURES

The following paragraphs provide recommended procedures for loading paper into the printer, setting the top of form position, manually adjusting the print margins, and replacing the ribbon cartridge.

Note that vertical forms length and margins are programmable and not restricted to the default values established at power up or the physical positioning of the paper tractors. Paragraph 3.3.2 provides detailed information for these and other programmable features of the printer.

#### 3.4.1 Loading Paper Into Printer

Paper is quickly and easily loaded into the IDS-460 Printer. Paper travels along the feed path shown in Figure 3-4, and is loaded as follows:

- Check that the power switch is ON.
- Position the FS/OFL/ONL switch to OFL.
- Momentarily position the FF/LF switch to FF to issue a form feed command.
- Place a roll or stack of paper in position. Fanfold stacks can be positioned at the back or bottom of the printer; roll paper mounts on an optional internal paper roller, with paper coming off the top. Pull approximately 12 inches of paper from the supply.

#### NOTE

*For best paper feed accuracy, assure that the paper path is not obstructed.*

- From the back of the printer, carefully pass the leading edge of the paper by the paper out sensor switch (see Figure 1-2) which protrudes into a small cutout in the front paper guide plate. Continue routing paper upward until the paper can be pulled past the printer head.
- If necessary, carefully flip down the locking mechanism (see Figure 1-2) on each paper pinfeed tractor, then slide the tractors horizontally along their guides, positioning them to the proper paper width. Lock both tractors in place after the paper is properly positioned.
- Flip open the covers on both paper pinfeed tractors. Position the pinfeed holes in the paper over the pins in the tractors, aligning paper at same time. Close pinfeed tractor covers to secure paper in place.
- Set ST switch to the right long enough to run a print test. Visually inspect print quality. If printing is too light, move the print head closer to paper; if printing is smudging, move the print head back. To adjust the print head, remove printer cover and rotate the Forms Thickness Adjusting Knob to obtain proper distance. Replace printer cover.

#### NOTE

*Power is disconnected from the printer when the cover is removed.*

- Adjust print margins (see paragraph 3.4.3) and check top of form position (see paragraph 3.4.2).
- Position FS/OFL/ONL switch to ONL to resume printing.



### 3.4.2 Setting Top of Form Position

To establish top of form positioning after loading paper into the printer or to change previously established top of form positioning, perform the following:

- a. Check that the power switch is ON.
- b. Position the FS/OFL/ONL switch to OFL.
- c. Check that the Mode Select DIP switches are set for the desired form length (see Table 3-2 and Figure 3-2). If DIP switch settings are changed, printer power must be cycled off, the DIP switch settings changed, then power cycled back on.

#### NOTE

*Form length may also be programmed; see paragraph 3.3.2.*

- d. Momentarily position the FF/LF switch to FF, then release; paper will advance to top of form.
- e. If paper is not positioned as desired, perform the following:
  1. Position the FS/OFL/ONL switch to FS.
  2. Position the FF/LF switch to FF to move the paper down or to LF to move the paper up. Paper will initially step in increments of 1/48th inch, then will slowly slew after a short delay.
  3. When desired top of form is reached, release the FF/LF switch.
- f. Position the FS/OFL/ONL switch to ONL to resume printing.

### 3.4.3 Adjusting Left and Right Print Margins

The left margin of the print line can be adjusted by sliding the paper and both pinfeed tractors to the left or right. Sliding both tractors to the left increases the left margin, and to the right decreases the left margin. (Left and right print margins are also programmable as described in paragraph 3.3.2.)

Both pinfeed tractors are moved by carefully flipping the locking mechanism at the outer side of each tractor down toward the bottom of the printer. This allows tractor movement along the guide rails to any position.

After moving each tractor, lock them in place and secure the paper to them. Then, generate a print test pattern by positioning the FS/OFL/ONL switch to OFL and the ST switch to the right. Check the new margin, and repeat this procedure as necessary until the desired margin is obtained.

### 3.4.4 Ribbon Replacement Procedure

Ribbon for the IDS-460 Printer is supplied in a snap-in ribbon cartridge which facilitates fast, easy replacement. To replace the ribbon cartridge, perform the following:

#### NOTE

*Use only those ribbon cartridges supplied or approved by Integral Data Systems.*

- a. Turn the printer power switch to OFF.
- b. Loosen the cover's four knurled retainer nuts, then remove the printer cover.
- c. To remove ribbon cartridge:
  1. Unlock the cartridge by depressing the red latching lever (Figure 3-5) at the right side of the cartridge.
  2. Slide cartridge to the right, over the red latching lever.
  3. Release the ribbon by carefully pivoting the knurled stuffing wheel forward, then lifting the ribbon up.
  4. Remove cartridge and ribbon from printer and discard.
- d. As required, clean ribbon stuffing wheels, guides and rollers with lint free tissue or "Q" tips dipped in isopropyl alcohol.
- e. Remove a new cartridge from its package. Assure that ribbon at stuffing (left) end of the cartridge is not fouled.
- f. Pull approximately 10 inches of ribbon from the left side of the cartridge, assuring that a slight tension is felt. Note the intentional twist in the ribbon which forms a "mobius" loop, enabling both sides of the ribbon to be used during printing, extending ribbon life. Keep the twist near the right side of the printer during the following steps.
- g. Position the ribbon cartridge on the printer approximately 1/2 inch to the right of its final position, so that it covers the red latch. Open the knurled stuffing wheels just wide enough to pass the ribbon between them, then release to lock the ribbon in place.
- h. Lightly press down on top of the ribbon cartridge while sliding it to the left; cartridge will lock into place with an audible "click".
- i. Open the stuffing wheels and pull several more inches of ribbon from the left side of the cartridge for easier ribbon path routing.
- j. Begin routing the ribbon at the yoke pivot (on the left side). Keep the ribbon flat (free of twists) and thread it around the left ribbon guide post, past the print head, then around the right ribbon guide post and ribbon roller. Leave all slack ribbon and the mobius twist between the right ribbon guide post and the ribbon roller.
- k. Turn the Slack Take-up Knob counterclockwise to wind the excess ribbon into the ribbon cartridge. Assure that the mobius twist remains between the right ribbon guide and the ribbon roller. Ribbon should become fairly taut without any slack.
- l. Recheck that the ribbon is in front of the print head, has the mobius twist on the right side, and is centered on all rollers.

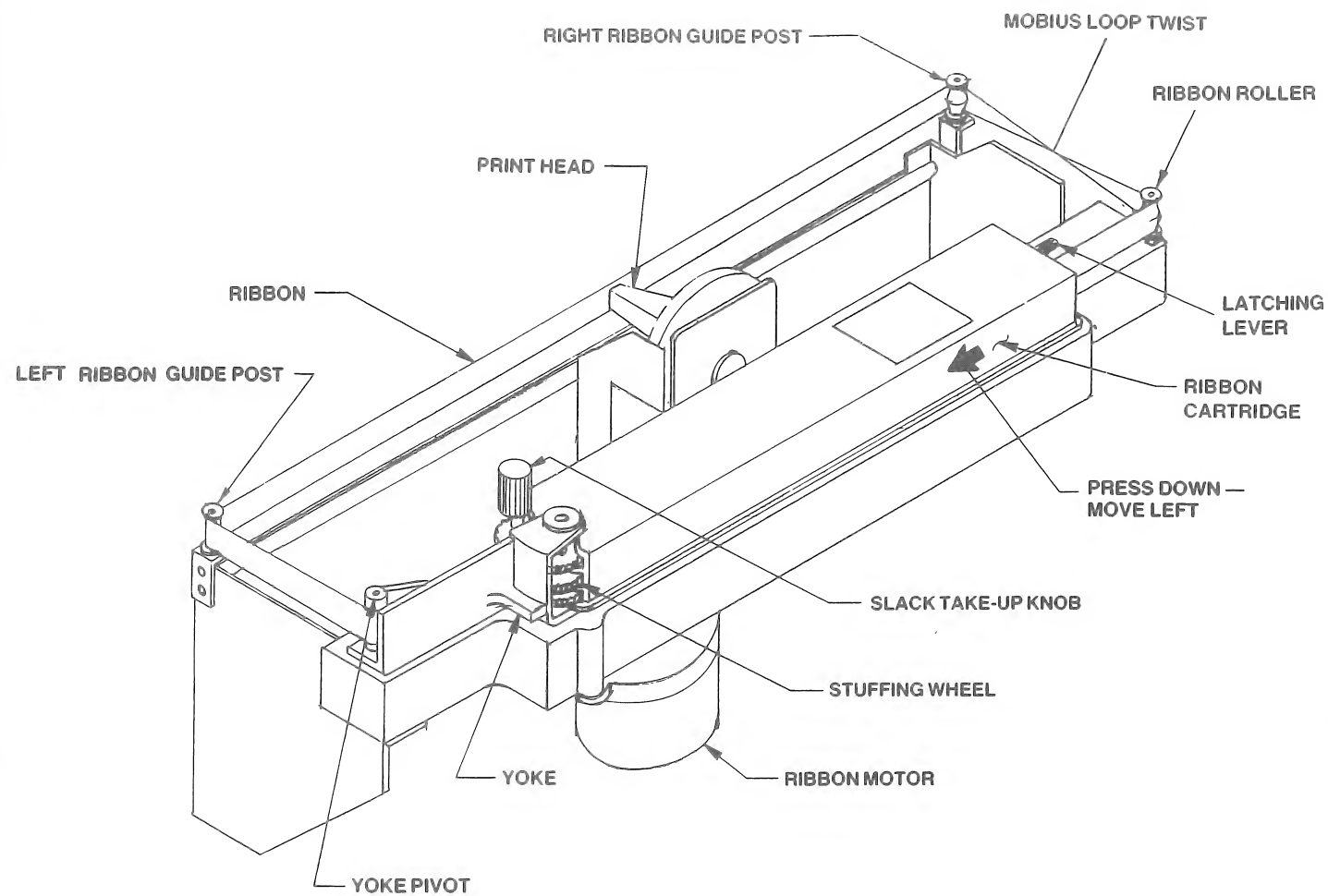


Figure 3-5  
Ribbon Guide Path

## SECTION 4 OPTIONAL DOT PLOT™ GRAPHICS

### 4.1 GENERAL

Use of the optional graphics dot plotting mode extends the printing capabilities of the IDS-460 Printer by providing the capability to print illustrations, charts, graphs, block lettering, etc., using arbitrary patterns of printed dots. By selectively energizing specific print needles during each horizontal scan of the print head across a page, specific patterns of dots can be printed to create the desired graphic sequence.

Characters received while in the graphics mode are printed as a single column of seven dots. Only the seven least significant bits in each character are printed as shown in Figure 4-1. A dot is printed for each bit that is set in the character. The least significant bit (Bit 0) is printed as the top dot, and bit 6 is printed as the bottom dot. Successive characters are printed in adjacent vertical columns as shown in Figure 4-2.

Graphics resolution is 84 dots per inch both vertically and horizontally. Dots are formed by print head wires 14 mils in diameter; the printed dot size is anywhere between 15 and 17 mils in diameter due to inherent variations in paper hardness, humidity and ribbon wear. Dots are printed on 1/84th inch centers, about 12 mils. (A mil is 1/1000th of an inch.)

### 4.2 GRAPHICS OPERATION

The printer is placed in the graphics mode upon receipt of an ETX character (Control-C). Once in the graphics mode an ETX is considered a special or escape character which signals the printer that a special function is to be performed as determined by the next character.

Three general functions can be controlled from the graphics mode:

1. Return to alphanumeric mode.
2. Perform a paper positioning or head motion control function.
3. Print an ETX as a graphical character.

#### NOTE

Ensure that the Automatic Line Feed is disabled (see Table 3-2).

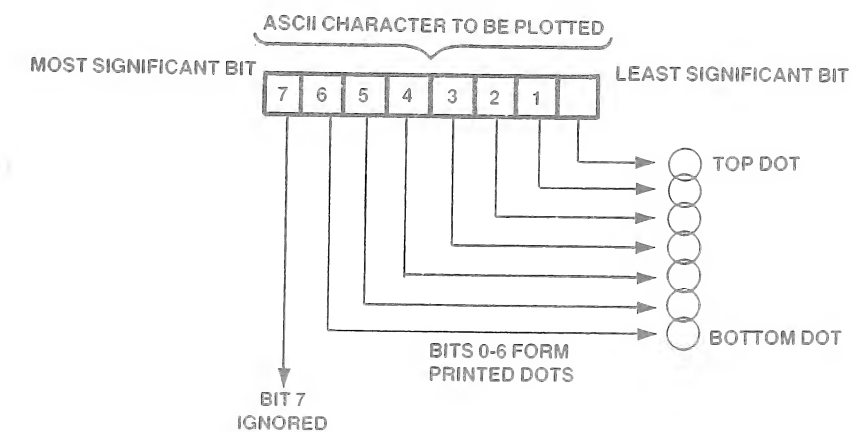


Figure 4-1  
Bit Mapping

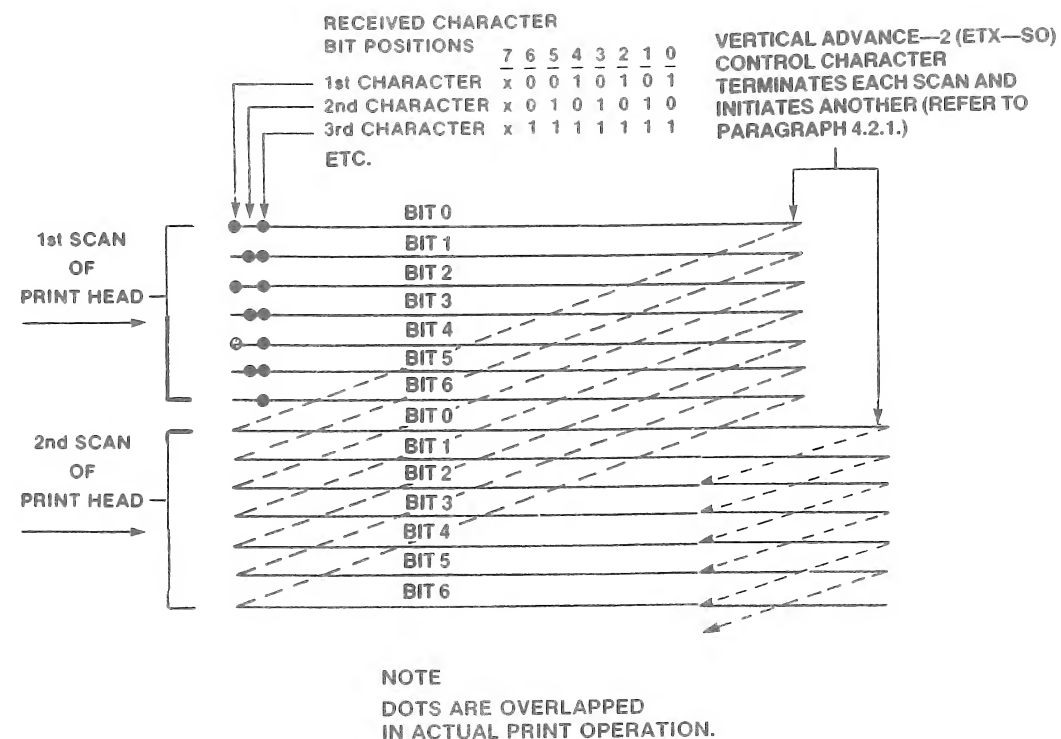


Figure 4-2  
Print Head Scanning

#### 4.2.1 Graphics Control Codes

Table 4-1 lists the legal control codes that can be sent in the graphics mode. To take effect each must be preceded by the printer escape character, an ASCII ETX. The printer can be returned to NORMAL mode, for example, by sending an ETX-STX combination. BASIC code to perform this operation is:

```
10 PRINT CHR$(3); CHR$(2);
```

Vertical Advance-2 is used to control both paper and print head positioning. During power-up it is programmed to provide graphics linefeeds. The current line is printed and paper advanced 7 dots when it is received.

ASCII character SO (Control-N) performs Vertical Advance-2 with a carriage return. ASCII character DC4 (Control-T) performs Vertical Advance-2 without a carriage return.

These two commands may be issued with the following lines of BASIC code:

```
10 PRINT CHR$(3);CHR$(20); Print current line and graphics linefeed, do not carriage return.
10 PRINT CHR$(3);CHR$(14); Print current line and graphics linefeed; return carriage to start
the next line.
```

Note that each of the CHR\$ functions above are followed by semicolons to prevent BASIC from issuing its own set of carriage returns and linefeed. This would cause these characters to be printed as graphics characters.

The ETX code can be printed as a graphics character by sending it twice in succession. The BASIC code for this is:

```
10 PRINT CHR$(3); CHR$(3); Print an ETX character in graphics. (The top two dots will be
printed.)
```

Table 4-1  
Valid Graphics Control Characteristics

Control Code	Decimal Code	Hexadecimal Coding	Terminal Keyboard	Function
STX	02	02	CTRL-B	Enter normal print mode (opposite of enhanced).
ETX	03	03	CTRL-C	Print ETX as graphics character.
HT	09	09	CTRL-I	Horizontal tab to next tab position.
LF	10	0A	CTRL-J	Carriage return and line feed (Vertical ADV-1).
VT	11	0B	CTRL-K	Vertical tab to next tab position.
FF	12	0C	CTRL-L	Form feed to next page.
CR	13	0D	CTRL-M	Carriage return to same line, and line feed if "Auto Line Feed" switch is enabled.
SO	14	0E	CTRL-N	Carriage return and vertical feed (Vertical ADV-2). (1/12 inch default-"Graphics" line feed).
DC2	18	12	CTRL-R	Vertical ADV-1 without carriage return.
DC4	20	14	CTRL-T	Vertical ADV-2 without carriage return.
EM	25	19	CTRL-Y	Vertical ADV-3 without carriage return.

#### NOTE

Table 3-4 provides more detailed control code descriptions. Expanded Function DIP Switch must be On to enable Graphics Mode.

#### 4.2.2 Bit Mapping

Each character printed while in the graphic mode makes up a vertical column about 1/84 of an inch wide. The least significant bit (bit 0) of the character controls the top dot of the column, and Bit 6, the most significant bit, prints at the bottom of the column. The following lines of BASIC code demonstrate how to control the dots to be printed:

```
10 PRINT CHR$(1); Print the top dot
10 PRINT CHR$(64) Print the bottom dot
10 PRINT CHR$(7); Print the top three dots
10 PRINT CHR$(0); Print a graphics "space"
```

Figure 4-1 shows the bit mapping layout in detail.

#### 4.3 GRAPHICS CONSIDERATIONS

It is important that the host computer issue graphics characters exactly as they are sent from the controlling software. Many computers trap special control characters and either delete, change or issue special sequences in place of the actual data sent by the controlling program. This can be a serious problem if, for example, the host computer is trying to maintain a line length of 40 characters and the graphics output consists of 400 characters per line.

Often times it is possible to prevent graphics characters from being trapped by adding decimal 128 (setting the most significant bit of the character) to whatever graphics codes are being sent. The IDS-460 Printer ignores this bit and most computer systems will not trap ASCII character values greater than decimal 127.

## SECTION 5 MAINTENANCE AND TROUBLESHOOTING

### 5.1 GENERAL

The IDS-460 PAPER TIGER™ Impact Printer, while designed for minimum maintenance, does require occasional cleaning and adjustments to maintain continuous error-free, high quality performance. Procedures for maintenance are contained in paragraph 5.2, along with procedures for replacing printer fuses.

Troubleshooting hints are included in paragraph 5.3. Paragraph 5.4 contains a brief technical description of the printer's electronic circuits. Included at the end of this section are circuit board assembly drawings and schematics.

### 5.2 MAINTENANCE

The following paragraphs describe cleaning/lubricating procedures and mechanical adjustment procedures for the IDS-460 Printer.

#### 5.2.1 Printer Cleaning and Lubricating

The printer's cover and internal areas are cleaned as follows:

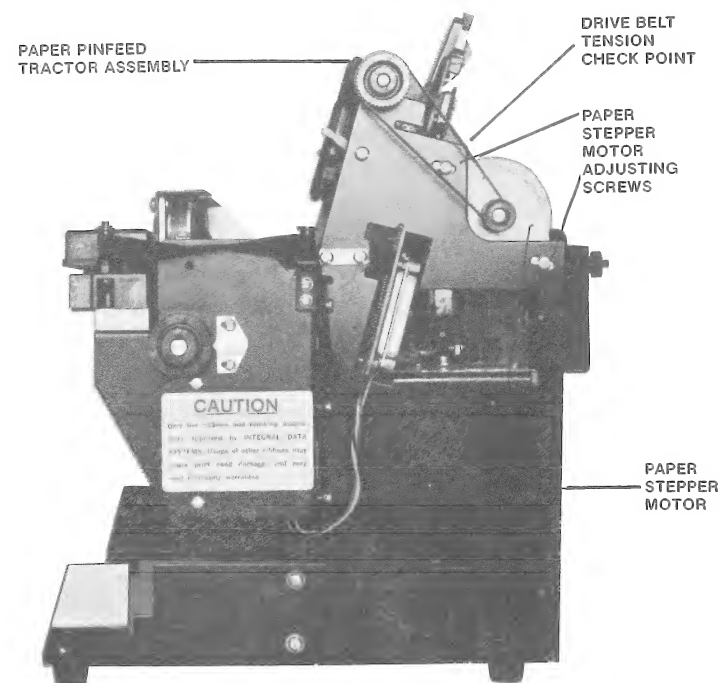
- a. Position the power ON/OFF switch to OFF and disconnect the AC line cord from the power outlet.
- b. To remove ink and embedded stains from the cover, wipe with a soft cloth moistened with isopropyl alcohol. Be careful not to spill alcohol into the printer.
- c. To clean the inside of the printer, loosen the cover's knurled retainer nuts and remove the cover.
- d. Using a lint free cloth, wipe the two carriage rails clean.
- e. Remove lint and other debris with a soft brush or cloth. If care is taken, a small vacuum cleaner may also be used.
- f. If dust accumulations in the controller board area are heavy, blow dust out.
- g. Upon completion of cleaning, install cover, tighten knurled retainer nuts, and restore power to printer.

Normally the printer does not require lubrication. However, if the left margin printed on the paper is uneven, it may be that the print head rails need lubrication. To lubricate, perform the following:

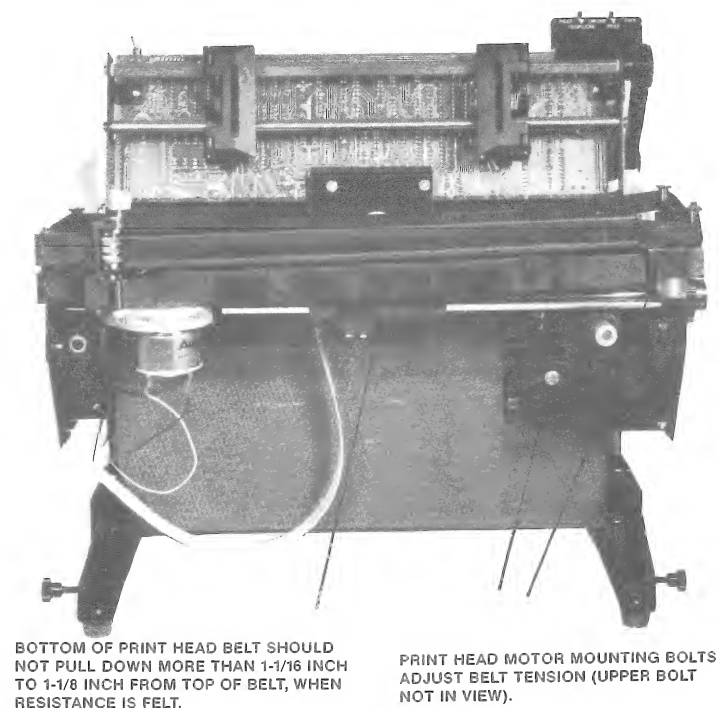
- a. Position the power switch to OFF, and disconnect the AC line cord from the power outlet.
- b. Remove the cover.
- c. Obtain a light machine oil or instrument oil (such as 3-in-1 oil or sewing machine oil).
- d. Place a small quantity of oil on a lint free cloth, then wipe both carriage rails with a cloth.
- e. Wipe away excess oil such that oil cannot be seen on rails.
- f. Install the cover and restore power to the printer.

#### 5.2.2 Mechanical Adjustment Procedures

There are two mechanical adjustments for the IDS-460 Printer: printhead drive belt tension and paper drive belt tension. Each adjustment is described in the following paragraphs.



**Figure 5-1**  
**Print Head Drive Belt Tension Adjustment**



**Figure 5-2**  
**Paper Drive Belt Tension Adjustment**

**5.2.2.1 Print Head Drive Belt Adjustment (See Figure 5-1).** The print head drive belt tension will normally not be required. However, if, after cleaning the head rails as outlined above, the left margin is not even, head belt tension should be adjusted. Proceed as follows:

- Position the power switch to OFF, and disconnect the AC line cord from the power outlet.
- Loosen the cover's knurled retainer nuts and remove cover.
- At the center of the carriage, gently pull the bottom part of the belt away from the top until considerable resistance is felt. When properly tensioned, the distance from the bottom part of the belt to the top will measure between 1-1/16 and 1-1/8 inches.
- To adjust the belt tension, first loosen the two head motor mounting bolts shown in Figure 5-1. Belt tension can be increased by moving the motor toward the right side of the printer.
- When proper belt tension has been established, tighten the head motor mounting bolts, install the cover, tighten the knurled retainer nuts, and restore power to the printer.

**5.2.2.2 Paper Drive Belt Tension Adjustment (See Figure 5-2).** Tension of the drive belt between the paper stepper motor and paper pinfeed tractor assembly should remain fairly taut, but not tight. Belt tension can be checked by removing the printer's cover and applying very slight finger pressure at the tension check point shown in Figure 5-2. Belt tension is correct if the belt can easily be depressed 1/8 to 1/4 inch. If adjustment is required, loosen the two stepper motor adjusting screws, reposition the stepper motor so that belt tension is correct, then tighten the adjusting screws.

### 5.2.3 Fuse Replacement

The IDS-460 Printer contains two fuses: a 1.2 amp slow-blow fuse (F1) in the AC power line and a 3 amp fast-blow fuse (F2) in the 60 VDC line. Both fuses are on the power supply circuit board. Replace blown fuse(s) as follows:

- Position the power switch to OFF.
- Disconnect the AC line cord from the power outlet.
- Loosen the four knurled retainer nuts securing the printer cover and carefully lift off the cover.
- At the back of the printer, locate the power supply circuit board. Circuit board and fuse locations are shown in Figures 2-1 and 5-3.
- Remove the power supply board cover by pinching each dual locking spacer, then gently pulling the cover forward and up.
- Remove and replace blown fuse with an identically rated fuse.
- Replace the power supply board cover.
- Replace the printer cover and tighten the four retainer nuts.
- Connect the AC line cord to the power outlet and position the power switch to ON.

#### CAUTION

*If the fuse(s) continues to blow, turn off the printer and locate the cause.*

### 5.3 TROUBLESHOOTING

Table 5-1 summarizes common problems that may occur in the IDS-460 Printer. In some cases service will be required. Your local IDS representative can assist you in locating the authorized service center nearest you, or contact the Customer Support Group at IDS. The Customer Support Group maintains a telephone to assist users and can be reached between 8:00 a.m. and 5:00 p.m. EST at 603-673-9100. Service assistance over the phone is offered free of charge.



**Table 5-1**  
**Troubleshooting Hints**

Problem	Possible Cause
Printer totally inoperative; PWR light remains off.	<ol style="list-style-type: none"> <li>1. No AC power applied</li> <li>2. Line fuse blown. Replace with a 1.2 amp slow-blow fuse per paragraph 5.2.3.</li> <li>3. Bad power supply board.</li> </ol>
Power light is on, head does not home; ONL and FAULT lamps are not flashing.	<ol style="list-style-type: none"> <li>1. 60 Volt fuse blown. Replace with 3 amp fast-blow fuse per paragraph 5.2.3.</li> </ol>
Power light is on, either or both ONL and FAULT lamps are flashing.	<ol style="list-style-type: none"> <li>1. Controller memory error.</li> </ol>
Printer operates in self test mode but not on line.	<ol style="list-style-type: none"> <li>1. Poorly seated or incorrectly wired interface cable.</li> <li>2. Interface option straps not set correctly.</li> <li>3. Printer is software deselected.</li> <li>4. Baud rate was set to wrong speed.</li> <li>5. Parallel interface timing incorrect.</li> </ol>
Printer loses or garbles characters in serial mode.	<ol style="list-style-type: none"> <li>1. DTR or XON/XOFF codes not being honored by data source.</li> <li>2. Incorrect baud rate selected.</li> <li>3. Noisy data line.</li> </ol>
Printer loses or changes data in parallel mode.	<ol style="list-style-type: none"> <li>1. Parallel interface timing incorrect.</li> <li>2. Noise on the interface.</li> <li>3. Parallel interface connector wired incorrectly or data lines shorted together.</li> </ol>
Printer becomes inoperative in use.	<ol style="list-style-type: none"> <li>1. Out of paper.</li> <li>2. Printer was software deselected.</li> </ol>
Printer always double spaces.	<ol style="list-style-type: none"> <li>1. Auto linefeed DIP switch is ON.</li> <li>2. Vertical Advance-1 was programmed for extra space.</li> </ol>
Printed lines are jammed together or overprinted.	<ol style="list-style-type: none"> <li>1. Paper is snagged or out of tractors.</li> <li>2. Paper motor pulley cracked or loose.</li> <li>3. Tractors are binding.</li> <li>4. Paper motor or controller board defective.</li> <li>5. Vertical Advance-1 programmed for short line loads.</li> <li>6. Automatic line feed disabled and no line feed sent via software.</li> </ol>
Ragged or uneven characters.	<ol style="list-style-type: none"> <li>1. Head is too close to the paper; adjust Forms Thickness Control Knob.</li> <li>2. Carriage rails are dirty.</li> <li>3. Ribbon is worn out.</li> <li>4. Cracked front needle guide in head.</li> </ol>

**Table 5-1**  
**Troubleshooting Hints (Continued)**

Problem	Possible Cause
Faded or missing dots.	<ol style="list-style-type: none"> <li>1. Head is too far back from paper; adjust Forms Thickness Control Knob.</li> <li>2. Ribbon is worn out.</li> <li>3. Bad head or controller board.</li> <li>4. Ribbon is not threaded correctly.</li> <li>5. Ribbon motor not running.</li> </ol>
Margins are uneven.	<ol style="list-style-type: none"> <li>1. Lines being printed in proportional mode have leading spaces or carriage return at end of each line.</li> <li>2. Head too close to paper.</li> <li>3. Carriage rails are dirty.</li> <li>4. Ribbon stuck on head.</li> <li>5. Loose head motor pulley.</li> <li>6. Head motor bearings binding.</li> <li>7. Head drive belt needs adjustment.</li> </ol>
Printer skips about an inch every so often.	<ol style="list-style-type: none"> <li>1. Auto page skip DIP switch is On.</li> </ol>
Printer changed print size.	<ol style="list-style-type: none"> <li>1. A print size control code was received.</li> </ol>
Print head catches on ribbon.	<ol style="list-style-type: none"> <li>1. Stuck print head needle.</li> <li>2. Controller malfunction.</li> <li>3. Head too close to paper; adjust Forms Thickness Control Knob.</li> </ol>
Print head and paper move but nothing is printed.	<ol style="list-style-type: none"> <li>1. Print head cable is unplugged from controller.</li> <li>2. Controller malfunction.</li> </ol>
Print columns do not line up in proportional mode.	<ol style="list-style-type: none"> <li>1. Carriage return command is being sent at end of each line instead of at end of paragraph.</li> </ol>

## 5.4 CONTROLLER/POWER SUPPLY TECHNICAL INFORMATION

The following paragraphs provide a technical description of the electronic circuits for the IDS-460 Printer (see Figures 5-3, 5-4, and 5-5.)

The information is not intended to be sufficient to repair the printer. Users requiring service or service assistance should contact their nearest IDS service center or the Customer Support Group.

The IDS-460 Printer controller board uses a Motorola MC6803 microprocessor controller chip to provide complete control of the print head needles, all motors, and the flow of data into the printer.

Random access memory (2048 bytes) is provided by four 2114L chips (U4, 5, 16 and 17). Three 2716 compatible EPROM sockets are provided. Jumper block Z1 provides straps to accommodate other variations of ROM/EPROM installations. Serial interfacing is provided directly by the 6803. Three baud rates (300, 1200, and 9600) are programmable directly in the 6803. The fourth rate (2400), selected by the user, is set by an RC combination on U28, a 555 oscillator.

Parallel interfacing is accomplished by U2, an 8 bit latch strobed by a sequence of logic starting with U26. The most significant bit is controlled by a jumper on Z2 pins 7 and 8 to advise the printer which interface is selected.

The head stepper motor logic consists of four sets of complimentary-symmetry drivers with chopped current control to provide adequate torque over the stepper motor speed range. Integrated circuits U32 and U33 are used as threshold comparators to drive chopper transistors Q22 through Q25 via logic inverter U31.

The paper stepper motor is driven in a conventional manner through power transistors Q4-Q7. The head solenoids are driven by Q8-Q16 in a similar manner. Q17 and Q18 select which row of print head solenoids are to be fired. Oneshots on IC U30 provide solenoid strobe timing and paper stepper motor timeout.

The DC ribbon motor is driven by Q9 which switches +10 volt unregulated power to it.

The power supply board contains the primary power switch (for 115 or 230 VAC power), two bridge rectifiers, DC filter capacitors and a 5 volt monolithic regulator. Output voltages are nominally 5 volts regulated at one amp, +10 volts unregulated, and 60 volts at 2 amps unregulated. The 5 volt regulated supply feeds all TTL and microprocessor logic; +10 volts is used by the ribbon motor and RS-232-C output drivers; the -10 volt supply is used only by the RS-232 output logic. The print head and paper stepper motors use the 60 volt supply.

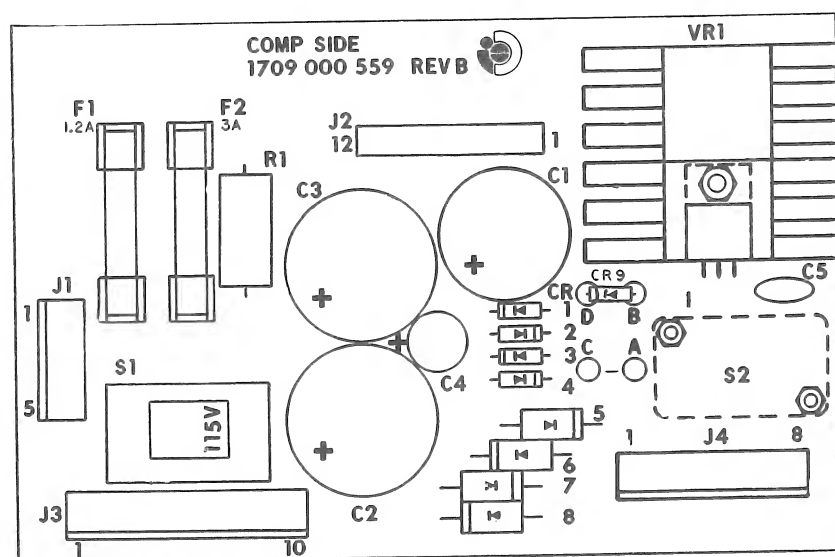


Figure 5-3  
IDS-460 Power Supply Circuit Board Assembly Drawing

parts for the IDS-460

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accommodate other  
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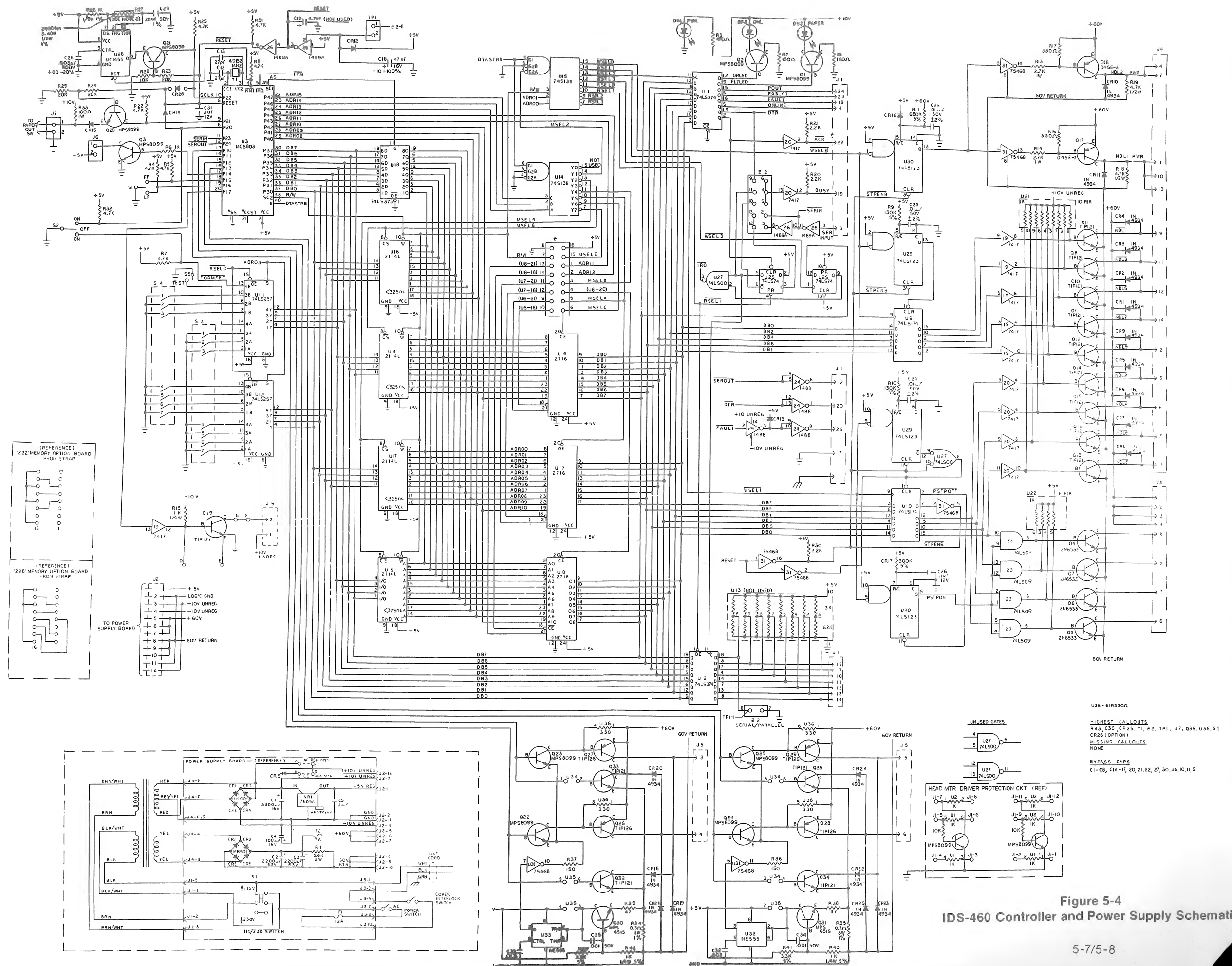
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ulated. The 5 volt  
ribbon motor and  
logic. The print head





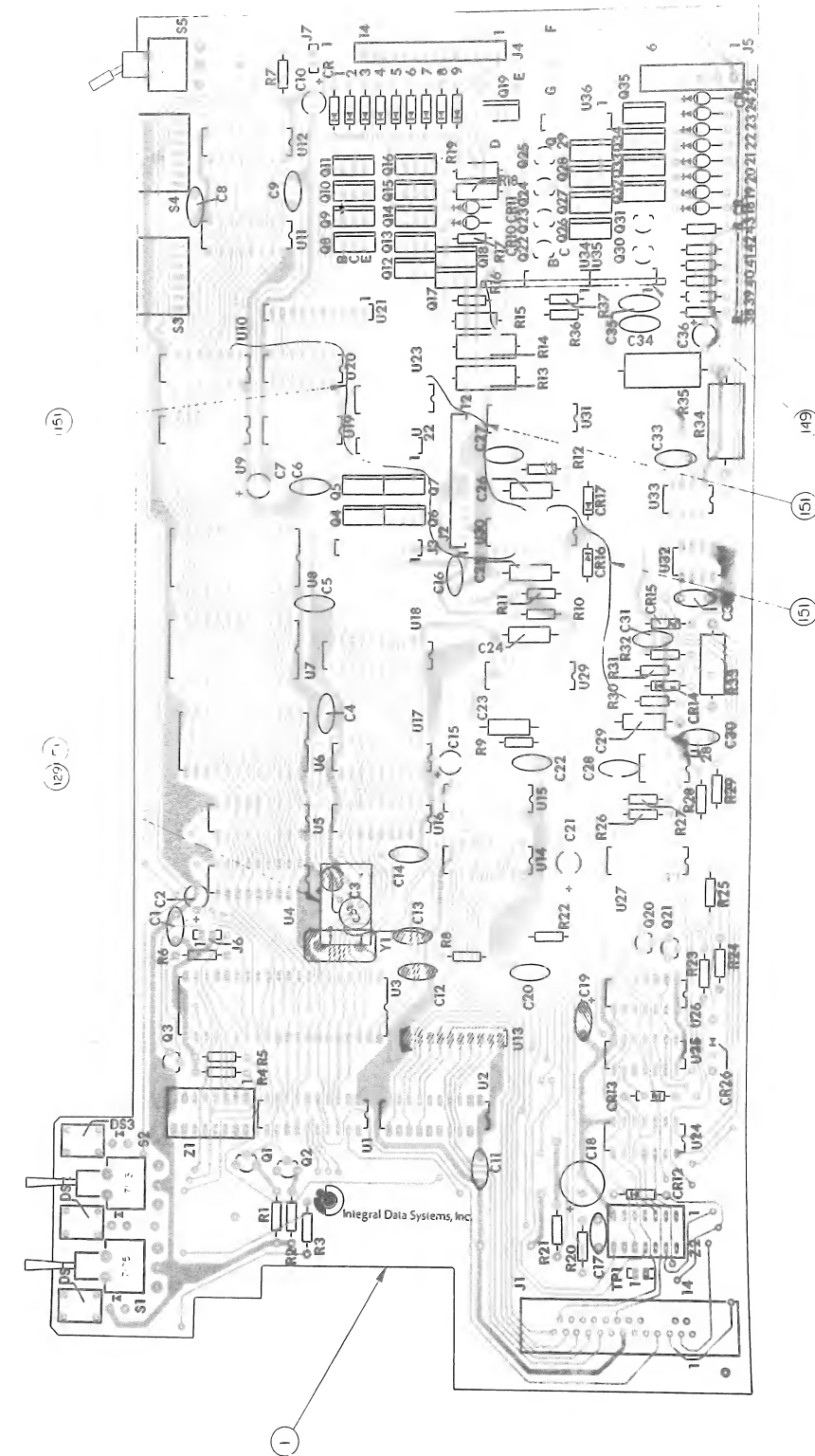


Figure 5-5  
IDS-460 Controller Circuit Board Assembly Drawing

# APPENDIX A CENTRONICS COMPATIBLE CABLE

Figure A-1 shows the wiring diagram for a Centronics Compatible Interface Cable. This cable contains a female EIA connector on one end and a Centronics compatible connector on the other. It allows any interface cable which is normally plugged into a Centronics printer to be plugged into it. The other (EIA) connector is then plugged into the IDS-460 to complete the connection.

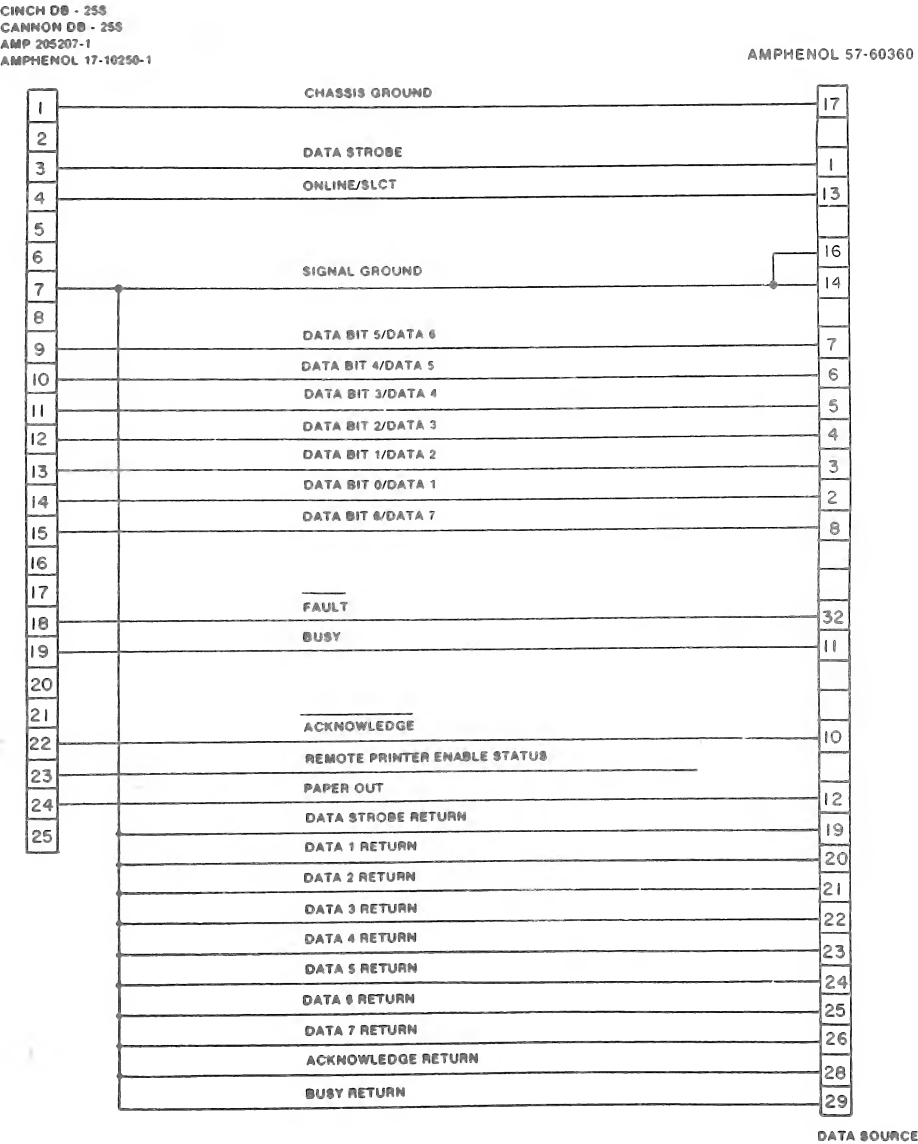


Figure A-1  
Centronics Compatible Interface Cable

## APPENDIX B PRINT SAMPLES ON THE IDS-460 PRINTER

This text is being printed on the IDS-460 printer using the justify mode, proportional spacing and a character pitch density of 10 cpi.

The margin has been set to about 5 inches in width to show the combined features. No carriage returns or line feeds are sent when text is justified, since the printer manages line lengths automatically.

Now the margins are set to only two inches in width. Be sure to notice that justification is still in effect and both the right and left margins are still straight.

This paragraph is printed using the fixed spacing mode. Justification has been left on to show its effect on character spacing. Now we will switch to 12 characters per inch print density, proportional spacing.

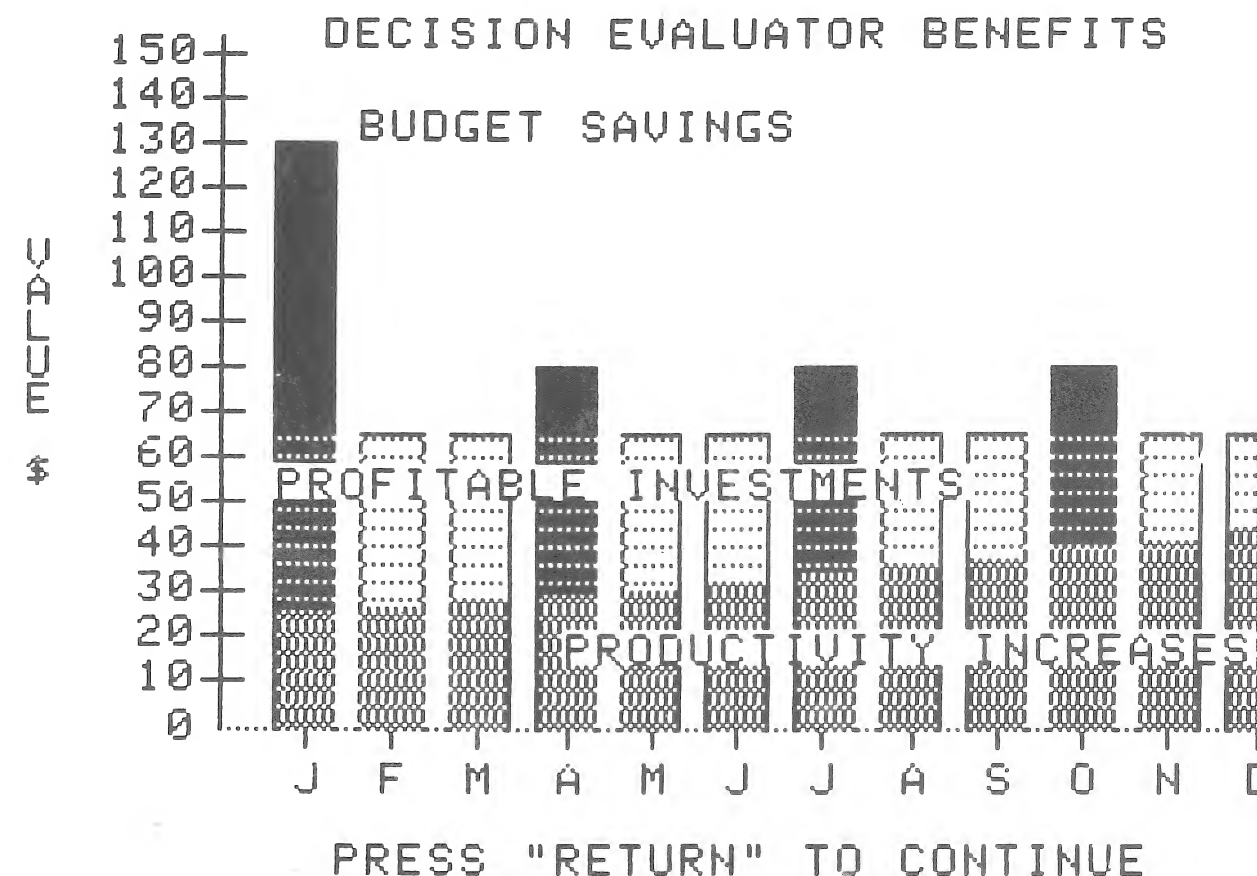
While we are at it, here is an example of 12 CPI ENHANCED printing. This is a <sup>Superscript</sup> and a <sub>subscript</sub> printed with only two control codes. A Vertical Advance-2 is used to move the paper down a half a line and Vertical Advance-3 moves it up a half line.

This demonstration was produced on an Apple Computer with the program listed below.

```

5 PR# 1: PRINT CHR$ (9); "132N"
15 REM SET MARGINS
20 PRINT CHR$ (27); "J,120,960,9"
25 REM SELECT ENHANCED MODE, 16.8 CPI
30 PRINT CHR$ (1); CHR$ (31);
33 PRINT TAB( 5);
35 PRINT "APPENDIX B: PRINT SAMPLES ON THE IDS-460 PRINTER"
40 PRINT : PRINT CHR$ (2); CHR$ (29); REM NORMAL MODE, 10 CPI
50 PRINT CHR$ (27); "J,240,840"; REM RESET MARGIN FOR TEXT
55 PRINT CHR$ (16); CHR$ (4); REM SELECT PROPORTIONAL SPACING, ADJUST MODE
57 PRINT "This text is being printed on the IDS-460 printer using the";
60 PRINT " justify mode, proportional spacing and a character pitch density of
10 cpi."
65 PRINT : PRINT
70 PRINT "The margin has been set to about 5 inches in width to show";
80 PRINT " the combined features. No carriage returns or line feeds are sent";
90 PRINT " when text is justified, since the printer manages line lengths";
100 PRINT " automatically."
110 PRINT
120 PRINT CHR$ (27); "J,420,660,9"; REM SET MARGINS TO ABOUT 2 INCHES
130 PRINT "Now the margins are set to only two inches in width.";
135 PRINT " ";
140 PRINT "Be sure to notice that justification is still in effect and both ";
150 PRINT "the right and left margins are still straight."
165 PRINT CHR$ (06); REM SELECT FIXED SPACING
170 PRINT CHR$ (27); "J,240,840"; REM BACK TO ORIGINAL MARGIN SIZE
180 PRINT
190 PRINT "This paragraph is printed using the fixed spacing mode. Justificatio
n has been left ";
200 PRINT "on to show its effect on character spacing. Now we will ";
205 PRINT "switch to 12 characters per inch print density, ";
210 PRINT "proportional spacing."
220 PRINT : PRINT
230 PRINT CHR$ (30); CHR$ (16); REM SELECT 12CPI, PROPORTIONAL SPACING
235 PRINT "While we are at it, here is an example of ";
240 PRINT CHR$ (1); REM SELECT ENHANCED MODE
250 PRINT "12 CPI ENHANCED";
255 PRINT CHR$ (2); REM BACK TO NORMAL MODE
256 PRINT "printing. ";
260 PRINT "This is a";
270 PRINT CHR$ (20); CHR$ (31); REM VERTICAL ADV-2, SELECT 16.8 CPI
280 PRINT "subscript";
290 PRINT CHR$ (25); CHR$ (25); CHR$ (20); CHR$ (30);
295 REM THE ABOVE LINE SENDS 2 VERTICAL ADV-3'S (REVERSE 1/2 LINE FEED) AND
296 REM ONE VERTICAL ADV-2 TO ALLOW FOR PAPER SLOP, THEN SELECTS 12 CPI.
300 PRINT " and a";
310 PRINT CHR$ (25); CHR$ (31); REM VERTICAL ADV-3 AND 16.8 CPI
320 PRINT "Superscript";
330 PRINT CHR$ (20); CHR$ (30); REM VERTICAL ADV-2 AND 12 CPI
335 PRINT " printed with only two control codes.";
340 PRINT " A Vertical Advance-2 is used to move the paper down a half a line";
350 PRINT " and Vertical Advance-3 moves it up a half line."
360 PRINT : PRINT
370 PRINT "This demonstration was produced on an Apple Computer with the ";
380 PRINT "program listed below."
390 PRINT : PRINT : PRINT

```



**Figure B-1**  
**An Apple Graphics Screen Dump on the IDS-460 Printer**  
 (Courtesy Computer Stations, Inc., #12 Crossroads Plaza, Granite City, ILL 62040)

## APPENDIX C GLOSSARY OF TERMS

This appendix contains informal definitions of the technical terms used in this manual.

### **Acknowledge**

A signal sent by the printer to indicate it has accepted the current character and is ready for another.

### **ASCII Character Set**

A standard that assigns numerical values to characters sent between common terminals and computers. The letter "A" for instance, is represented as the number 65 (41 HEX). Other standards for accomplishing the same thing exist. (Baudot and EBCDIC are two examples.)

### **ASCII Value**

The numeric value assigned a character using the ASCII character set.

### **BAUD**

A method of defining the number of bits per second sent over a data line. This number is obtained by multiplying the number of characters per second sent over a data circuit by the number of bits used to define the character. A circuit transmitting 120 characters per second using standard ASCII codes, for example, is said to be operating at 1200 baud.

### **Bit**

The smallest unit of information in a byte of information. An ASCII character usually is made up of 7 data bits and one bit of parity.

### **Buffering**

Computerese for the act of holding data in temporary storage while it or other data is being processed. In the IDS-460 Printer incoming data is buffered, that is, held temporarily, while data already received is printed.

### **Bus**

A group of signals, usually related, that interconnect logical elements; i.e., equipment or electronic components such as memories or I/O devices.

### **Busy**

A signal from the printer that indicates it is not ready for more data.

### **Byte**

Commonly, a piece of information consisting of 8 bits. It may represent a character or number depending on use.

### **Control Code**

A character, usually non-printing, that controls a function in the printer. An ASCII "FF" character, for example, causes a form feed in the printer.

### **Default**

The value the printer assigns a programmable feature if it is not set by the user. For example, the forms length defaults to the setting programmed by the DIP switches when the printer is turned on.

### **Default Character Set**

The character set used when no user supplied set is selected or available.

### **DIP**

An abbreviation for Dual Inline Package, a common way of housing integrated circuits.

### **DIP Switch**

A subminiature switch that can plug into a DIP socket. These are used on the IDS-460 Printer to program many default parameters.

## APPENDIX C (Continued) GLOSSARY OF TERMS

### ESC or ESCAPE

In the ASCII code, a character whose value is 27. Alternatively, an escape character is one which indicates to the controller that the following character is a control code of some sort or another.

### Form Feed

A form feed command moves paper to the top of the next form. When using common fanfold paper, this means going to the next sheet. It is sent using the ASCII "FF" or Control-L code. The IDS-460 Printer has eight common forms lengths settable by the DIP switches, and can be programmed to practically any form length as well.

### Hexadecimal Code

A numbering system using base 16 rather than base 10, as for decimal. The numbers 10 to 15 are represented by the letters A through F.

### Host Computer

The computer to which the IDS-460 Printer is connected. This may be a microcomputer or a large timesharing system.

### I/O

An abbreviation for input/output. An I/O device might refer to electronic circuits performing input/output functions or, in a system, output to a printer, tape reader or CRT terminal.

### Line Feed

This command causes the paper to be moved vertically, usually to provide space between printed lines. The IDS-460 Printer has three programmable "line-feeds" designated vertical advance 1, 2 and 3.

### Logic State

The logic state of a signal indicates whether the signal is true or false, on or off, or "yes" or "no". A TTL level indicates either of these two states by switching between 0 and +5 volts. There is no formal assignment between the two TTL levels and logic states.

### Parallel Data

Data that is sent over several wires at once. The IDS-460 Printer accepts parallel data over an eight wire cable. Other signals on the parallel interface include strobe, busy, acknowledge and other status signals.

### Parity

Usually an extra bit at the end of a serial character to make the number of bits set in the character even for even parity, or odd if odd parity is selected. This is used for error checking.

### Print Buffer

An area in memory within the IDS-460 Printer that temporarily holds incoming data until it can be printed. For a short time this allows the printer to accept characters faster than it can print them.

### Random Access Memory (RAM)

This is memory within the IDS-460 Printer that can be both read and written by the controller. It provides temporary storage for both data and controller information.

### Read Only Memory (ROM)

This memory contains the program that the controller uses to control the IDS-460 Printer. It also contains the default character set.

### RX

An abbreviation for received data.

## APPENDIX C (Continued) GLOSSARY OF TERMS

### Serial Data

Data that is sent over a single wire. The individual bits that make up the character are sent sequentially one after another.

### Set

Commonly, a bit is set when it is made a logic "one".

### Strapping

Connecting two electrical signals together. In the IDS-460 Printer, this is done to program various interface parameters by plugging jumper wires into a socket.

### Strobe

A signal used in parallel interfaces to indicate that a character has been placed on the interface bus and is ready for the printer to accept it. When the character has been accepted the printer responds with an acknowledge.

### TTL Level

A short hand way of defining the type of signals used in the IDS-460 Printer. Generally, this type of signal is either 0 or +5 volts, and never anything between.

### TX

An abbreviation of transmit data.

### Vertical Advance

On the IDS-460 Printer, paper may be moved in either direction upon receipt of a vertical advance control code. Each of three separate vertical advances may be programmed for any practical amount of paper movement in either direction.

### XOFF

An ASCII character (Control-S) sent to a computer to indicate that the printer does not wish more data to be sent at the present time.

### XON

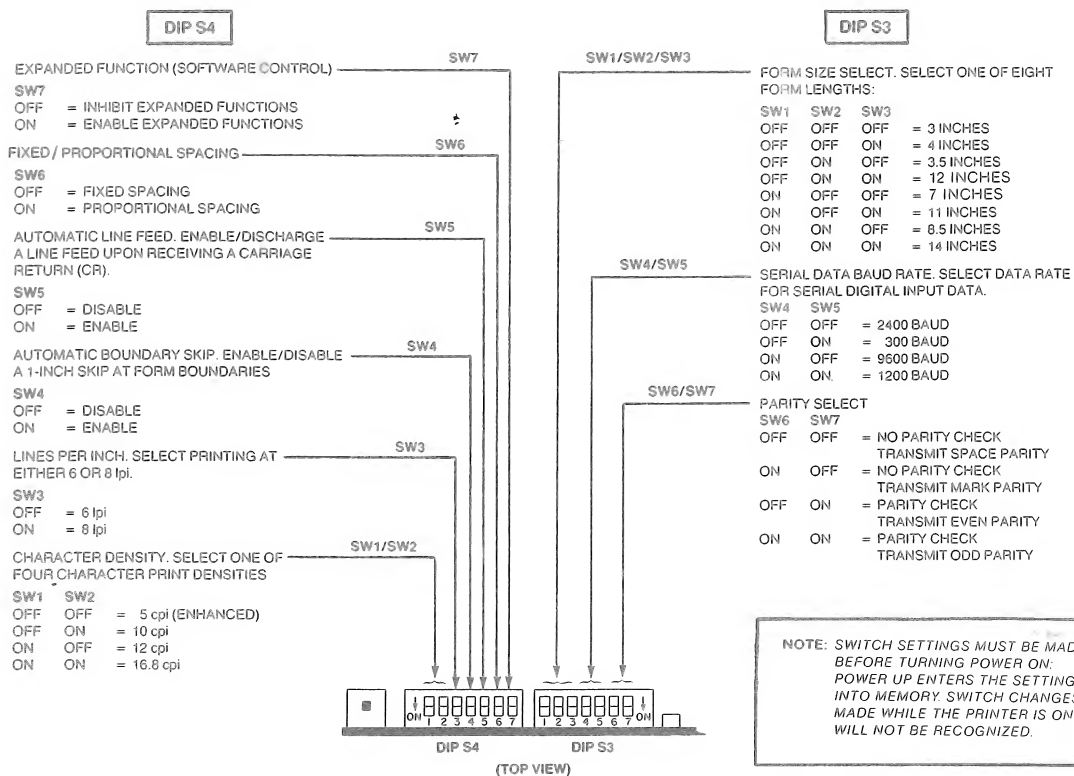
An ASCII character (Control-Q) sent to a computer to indicate the willingness of the IDS-460 Printer to accept data.

## CONTROL CODE REFERENCE TABLE

The following table provides easy reference to the control codes used by the IDS-460 Printer when the expanded function DIP SWITCH S4-SW7 is on. See Table 3-4 for more detailed function descriptions.

Printer Function	Control Code	Decimal Code	Hexadecimal Code	Keyboard	Function
<b>CARRIAGE RETURN</b>	CR	13	0D	CTRL-M	Carriage return (and vertical ADV-1 if Auto Line-feed is enabled).
<b>MODES</b>					
Enhance	SOH	01	01	CTRL-A	Set ENHANCED MODE of operation.
Graphics	ETX	03	03	CTRL-C	Set GRAPHICS MODE of operation.
Normal	STX	02	02	CTRL-B	Set NORMAL MODE of operation.
<b>SPACING</b>					
Fixed	ACK	06	06	CTRL-F	Select FIXED spacing.
Proportional	DLE	16	10	CTRL-P	Select PROPORTIONAL spacing.
<b>FORMFEED</b>	FF	12	0C	CTRL-L	FORMFEED
<b>JUSTIFY</b>					
On	EOT	04	04	CTRL-D	Justify text.
Off	ENQ	05	05	CTRL-E	Turn off justification.
<b>LINEFEED</b>	LF	10	0A	CTRL-J	Vertical ADV-1 and carriage return.
<b>PRINT DENSITY</b>					
10 C.P.I.	GS	29	1D	CTRL-]	Select 10 CPI print density.
12 C.P.I.	RS	30	1E	CTRL-↑	Select 12 CPI print density.
16.8 C.P.I.	US	31	1F	CTRL-__	Select 16.8 print density.
<b>PROGRAM PRINTER</b>	ESC	27	1B	CTRL-[	Programming escape code.
Select	DC1	17	11	CTRL-Q	Select.
Deselect	DC3	19	13	CTRL-S	Deselect.
<b>TAB</b>					
Horizontal	HT	09	09	CTRL-I	Horizontal Tab.
Vertical	VT	11	0B	CTRL-K	Vertical Tab.
<b>VERTICAL ADV</b>					
ADV-1 W/O CR	DC2	18	12	CTRL-R	Line Feed W/O CR.
ADV-1 and CR	LF	10	0A	CTRL-J	Line feed and CR.
ADV-2 W/O CR	DC4	20	14	CTRL-T	(Defaults to subscript or graphics linefeed).
ADV-2 and CR	SO	14	0E	CTRL-N	(Defaults to subscript or graphics linefeed)
ADV-3 W/O CR	EM	25	19	CTRL-Y	(Defaults to superscript)





### Mode Select DIP Switches

Programmed Function	Command Character	No. Argument Fields	Argument Units	Default Values
Set Vertical ADV-1	B	1	1/48 inch	If DIP switch set to 6 lpi, default = 8 units (8/48 inch). If DIP switch set to 8 lpi, default = 6 units (6/48 inch).
Set Vertical ADV-2	C	1	1/48 inch	4 units (4/48 inch).
Set Vertical ADV-3	D	1	1/48 inch	-4 units (reverse 4/48 inch).
Set Vertical Tabs	E	1-8	1/48 inch	0 units
Set Horizontal Tabs	F	1-8	1/120 inch	0 units
Set Absolute Horizontal Position	G	1	1/120 inch	Set Head position relative to left margin.
Set Absolute Vertical Position	H	1	1/48 inch	Set Vertical position relative to top of form.
Set Right/Left Margins	J	2	1/120 inch	—
Set Form Size	L	2	1/48 inch	Per DIP switch setting.
Set Absolute Line	M	1	—	—
Set Horizontal Character Position	N	1	—	—
Set Intercharacter Spacing Increment	P	1	1/24 char. width	0 units

### Programming Functioning and Parameters





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